



**GEORGIA DEPARTMENT OF AGRICULTURE
2009 Specialty Crop Block Grant Program
Final Performance Report - 12-25-B-0917
Date Submitted: January 7, 2013**

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1. FARM TO TABLE – HIGHLIGHTING THE LIVING HISTORY AND HERITAGE OF GEORGIA GROWN FRUITS AND VEGETABLES – FINAL PERFORMANCE REPORT

Project Summary: Georgia Public Broadcasting's production and airing of 15 vignettes on Georgia specialty crops began with the 2008 grants, and continues with this 2009 grant. There were 69 total airings from November 14, 2009 through December 21, 2010. With the first 2008 grant, there was a change of scope from the initial project; therefore, work on this grant did not begin on time. The funds from the second 2008 grant were combined with the prior grant's funds, and the planning and development of the project began. The 2009 grant made it possible to complete the entire project. The funding from all three grants has been spent. The 15 crops spotlighted by the project were: pecans, Christmas trees, wine/vineyards, greens, strawberries, Vidalia Onions, peaches, melons, blueberries, peppers, tomatoes, field peas/beans, apples, nursery crops and honey.

Each vignette was viewed by a GPB Television audience = to a Nielsen 1, which is an average audience size for GPB Television and equates to one percent of Georgia viewers and households. This Nielsen number 1 equates to 31,754 Georgia households as of our Nielsen data from October 2010.

We have aired 268 spots aired on GPB Radio. East radio spot is heard by an average size GPB Radio audience of 6,400 per quarter hour based upon Arbitron data from October 2010. Therefore, 1,459,200 Georgians have heard information about specialty crops.

Finally, the Georgia Cooks website has been accessed by over 6,332 visitors from November of 2009 to December 15, 2010.

Project Approach: Georgia has a bountiful growing season and we reflected crops as they came into season. Each vignette gave the history of the crop, information about the crop, beauty footage of the crop, a Georgia farmer/farm that produces the item, and how the item would be used by the consumer. Our website has each vignette available for viewing. Our Georgia Cooks website is another resource for the Georgia consumer to learn how to prepare recipes including specialty crops.

Goals and Outcomes Achieved: We increased awareness, marketability, and consumption of Georgia Grown specialty crops. We reached over 8.2 million Georgians with information about specialty crops in Georgia. Total specialty crop sales at the state farmers' markets and compiled numbers from community markets and grocery stores in 2009 were \$42,826,022.95. Total sales for 2010 were \$47,539,582.14. There was an increase of 11 percent.

Beneficiaries: Georgians who saw a vignette or heard a radio spot and bought Georgia specialty crops benefited; they bought the freshest and healthiest produce available. Purchasing Georgia Grown produce is good for their health. Georgia farmers and growers benefited because of their

product being promoted, which increased their sales. Georgians were educated about specialty crops as part of the promotion.

Lessons Learned: Using Georgia Public Broadcasting is a fast and highly visible way to promote Georgia Grown produce. We can reach a large number of Georgia, as well as out-of-state consumers in a short period of time. We need to expand on the vignettes and radio spots in the future.

Contact Person: Carol Danford, Corporate Account Executive; Georgia Public Broadcasting; 404-685-2583; cdanford@gpb.org.

Additional Information: To access the archived vignettes and additional Georgia specialty crop information, please go to: www.gpb.org/georgiacooks

2. INCREASING GEORGIA GROWN PEACHES MARKET SHARE – GEORGIA PEACH COUNCIL AND GEORGIA AGRICULTURE COMMODITY COMMISSION FOR PEACHES - FINAL PERFORMANCE REPORT

Project Summary: We received the above specialty crop grant for the 2010 peach crop to be used during the summer of 2010. From success achieved in 2008, growers agreed a huge opportunity still existed in further promoting Georgia Peaches in the state of Georgia and focusing primarily on Atlanta. In addition to **\$105,000 grower-committed funds**, the \$45,000 grant allowed the Georgia Peach Council to promote the crop in the city of Atlanta and increase the market share of GA grown peaches in the Atlanta retail market. These funds were critical for the industry to promote its 2010 crop and continue to take back market share against the two largest threats: California & South Carolina.

Project Approach: Below are the 4 marketing initiatives that the SPCG helped fund:

1. Re-launching of the www.gapeaches.org website (\$15,000)
 - a. We rebuilt and re-launched the website
 - b. New website was a huge success in that we saw traffic increase from 3,000 hits during summer '09 to over 12,000 hits during summer '10
 - c. Using Google analytics, we gained valuable knowledge on why people are visiting our site and have put plans in place for 2011 to capitalize on this interest
2. Developing B-Roll film footage for media outlets (\$7,000)
 - a. At the request of our PR firm, we captured on film all aspects of growing peaches in Georgia: pruning, thinning, picking, packing & shipping
 - b. This footage will be used by media outlets nationally to promote the Georgia peach crop for upcoming seasons
3. Sponsoring several consumer events in the ATL area and handing out peaches (\$8,000)
 - a. "The PeachTree Rd Race"—Growers handed out 60,000 individual pieces of fruit to attendees and participants of the nation's largest 5K. This is now our signature event!
 - b. "Peaches in the Park" – Family Fun Day at Centennial Olympic Park, May

- c. "Throw Out the First Peach" – Gwinnet Braves, Ga Peach Day, July
 - d. "Know your Ga Farmer" – Atlanta Children's Museum, July
4. Billboards (\$35,000)
- a. Increased our billboard presence in and around Atlanta by 50%
 - i. Had 7 big boards on the interstates (compared to 5 in 2009)
 - ii. Had 20 posters on major surface roads (compared to 12 in 2009)
 - b. We received an enormous amount of feedback from consumers and retailers alike that the boards were "working" as it made them want to find Ga Peaches

Goals and Outcomes Achieved: The result of the 2010 campaign was a great success. The trend on consumers asking for Ga Peaches is moving in a positive direction. All major retailers in the ATL area participated in the program and have reported positive growth (Walmart, Kroger, Publix, Ingles, Whole Foods, The Fresh Market). Below we measured some specific outcomes compared to our initial campaign:

Expected Outcome 1- Increase the total sales of Georgia Peaches by 5-7% during peak season (June/July) in and around metro Atlanta.

Actual Outcome 1- Total shipments of Georgia Peaches in the Atlanta area during the 2010 season **grew some 15% and exceeded 150 loads.**

Expected Outcome 2- Increase the price per unit 5-7%.

Actual Outcome 2- Price per unit actually decreased year over year. This was directly related to supply. The peach industry as a whole recognized the biggest crop on record within the last 15 years. Higher prices were difficult to maintain against stiff competition from other growing areas. That being said...**pricing into Atlanta was an estimated \$2 per carton higher than other markets along the east coast.**

Expected Outcome 3- Add permanent shelf space in retail markets for Georgia Peaches during our peak season promoting "Georgia Grown" Peaches.

Actual Outcome 3- Georgia Peaches were not only offered all summer but promoted during the months of June and July from all major Atlanta retailers including Publix, Kroger, Walmart, Ingles, Fresh Market and Whole Foods.

Beneficiaries and How They Benefited: It is debatable on whether growers received the most benefit with major volume and net return on peaches into Atlanta relative to other markets, OR consumers who got to enjoy Sweet Georgia Peaches all summer long at nearly every market in the Peach State. Growers undoubtedly recognized huge benefit as they continue to fund promotions in Georgia and this past season have taken a similar approach to Florida.

Lessons Learned: The primary lesson learned was/is consumers prefer Georgia Peaches. Again, as evident by the increased dollars, growers are spending collectively on hammering home the Georgia Peach message; we genuinely believe consumers prefer the brand. Challenges going forward are dynamic but the strategic plan is requesting that consumers ask for Georgia Peaches in other markets. The success of the 2010 specialty crop grant has propelled the Georgia Peach Council into a more aggressive marketing

campaign throughout the Southeast. We are going to continue to focus on Atlanta, but we are starting a push South into Florida, specifically Orlando and Tampa. Our future plans include:

- Billboards: keep ATL boards the same and create new boards in Tampa/Orlando
- According to our information, 80% of visitors onto www.gapeaches.org are there searching recipes and what to do with the peaches they just bought. We will be creating a “How-to” page and an updated recipe section using an official spokesperson.
- Create video footage of the “How-to” section to promote consumption and usage
- Sponsorship of the Peachtree Road Race
- General media outreach from the Ketchum PR firm
- Development of an official “Georgia Peach Council Spokesperson”

Contact Person: Duke Lane III; 478-952-9000; duke3@lanepacking.com

Additional Information: www.gapeaches.org

3. CONTRACTORS, GARDEN CENTER PERSONNEL AND HORTICULTURE CONSUMERS – GEORGIA GREEN INDUSTRY ASSOCIATION – FINAL PERFORMANCE REPORT

Project Summary

This project made it possible for the Georgia Green Industry Association (GGIA) to educate all levels of producers and users of green industry products with the ultimate goal of reducing water usage and increasing the efficiency of water used. Historic droughts, water restrictions and resulting misinformation necessitated bringing new techniques, methods and best practices to growers, contractors, retail outlets and consumers on how to reduce their overall water usage and to use the water they did use more efficiently. These droughts brought the horticulture industry in Georgia to a halt, severely affecting an industry that has a significant impact on the State's economy. Through numerous educational seminars and the production of online and printed materials, many of these users received instruction on these crucial issues.

Project Approach

Nursery Growers had the opportunity to work on water conservation techniques via a two-hour session that was provided specifically for the nursery producer on January 27, 2011. There were 16 producers in attendance for this session. In November 2009, two days of irrigation training, plus one day of certification testing, were held at the Stripling Center in Camilla, Georgia. There were 15 people who attended these sessions and eight individuals were certified with the Irrigation Association.

On January 27, 2010, there were three one-hour sessions taught in conjunction with the WinterGreen conference and trade show in Duluth. There were 37 people who attended the sessions. Several other classes were taught for both the landscape contractor and the irrigation contractor. There were five additional one-hour sessions taught at the WinterGreen show on January 27, 28 & 29. There were 72 people in attendance.

There were six additional one-hour sessions taught at the WinterGreen show on January 26, 27 & 28, 2011. There were 325 people in attendance in these six additional sessions.

On January 26 and 27, 2011, 16 hours of training for the landscape and irrigation industry were taught by the national Irrigation Association in conjunction with the WinterGreen conference and trade show in Duluth. There were 10 people who attended the sessions.

On January 25 and 26, 2012, 10 hours of training for the landscape and irrigation industry were taught at the WinterGreen 2012 in Duluth, GA in two separate sessions. There were 71 people in attendance.

Additional classes taught for the landscape and irrigation contractor trade included:

- February 25, 2010; a one-day seminar was held at Chattahoochee Technical College in Acworth; six hours instructional material. There were 46 people in attendance.
- April, 2010; a one-day training session was held at Ewing Irrigation Company in Atlanta; two hours instructional material. There were 31 people in attendance at the event.
- February 3, 2011; Okefenokee Technical College; seven hours instructional materials with 92 people in attendance.
- February 15, 2011; Macon State College; seven hours instructional materials with 106 people in attendance.
- February 2, 2012; Okefenokee Technical College; seven hours instructional materials with 97 people in attendance.
- February 25, 2012; Macon State College; five hours instructional materials with 27 industry people in attendance and over 50 local gardeners in attendance.

In total, 929 producers and direct influencers received training in 2010-2012 with funds provided by this grant, exceeding the goal of 500 individuals or an 85% increase in the expected number of participants. There were 17 events produced by the funding in the grant, exceeding the target number of 10 events.

This project has experienced no problems or delays in providing training in 2010, 2011 and 2012. As a result of the success of this grant, future classes are already scheduled on January 23, 24 & 25 at the WinterGreen 2013 show in Duluth as follow-up sessions to those offered during the grant.

When the Georgia Irrigation Association merged with the Georgia Green Industry Association in January, 2009, there were 10 certified landscape contractors in the state. Today, there are 44 certified landscape contractors through the national Irrigation Association. This exponential increase of 34 individuals almost meets our ambitious goal of having 35 additional people certified during the time period of the grant.

Goals and Outcomes Achieved

GOAL: Landscape and Irrigation Contractors: Throughout the project period, GGIA will conduct no less than 10 educational events for landscape and irrigation contractors. We expect to provide timely and technical irrigation education to no less than 500 landscape and irrigation contractors. Through IA's nationally-sanctioned certification programs, we expect that 35 landscape and irrigation professionals

will complete an adequate number of training courses and successfully pass national certification exams.

OUTCOME: GGIA members in irrigation and landscape had a full component of education available to them over the three-year grant period. As such, 929 attendees benefitted from the education and 34 individuals were able to move forward with rigorous certification in irrigation methods administered through the national Irrigation Association. GGIA members in the wholesale nursery segment also benefitted. There were educational materials offered to them via seminars, on-line seminars and other education offered with a regional grant from one of the grant educators. Sixteen producers received the in-depth water conservation training made available through this grant award.

Additionally, 50,000 Water Smart brochures were printed and distributed to 76 retail garden center members of GGIA, provided to metro-Atlanta area water systems for their customers and provided to all the local County Extension Agents. This brochure is a roadmap for efficient planting and irrigation of a home landscape. Outdoor water use should continue to decline as homeowners become more educated on the efficient use of outdoor water and correct planting methodology.

GOAL: *Printed materials and training DVDs will be prepared and distributed to no less than 40 garden centers and/or mass merchant garden departments throughout the state. It is expected that a minimum of 10,000 consumers will be presented with the opportunity to obtain water conservation materials through point-of-purchase displays at local garden centers. Additionally, video clips demonstrating best management practices for homeowners will be available as downloads from the websites of GGIA, UGA Center for Urban Agriculture, GWWC, GAWP, and other garden center and water purveyor websites.*

OUTCOME: There were problems producing the video portion of this project. Finding a provider for the actual production of the DVDs was difficult with the reduction in funds that was mandated from the original grant request. As the funding was not sufficient to produce the video, those funds were placed into the amount available for printing of the consumer water brochure. As a result, there were 50,000 water brochures printed and made available to 76 retail garden centers across the state that are GGIA members and provided to 157 Georgia County Extension offices.

Beneficiaries

The beneficiaries from this project include GGIA members in the irrigation and landscape areas because of the extensive education they received over the period of the grant. There were 929 attendees who benefitted from the education, and 34 individuals who were able to go forward for certification in irrigation methods. GGIA members in the wholesale nursery segment also benefitted. The 76 retail garden center members of GGIA received Water Smart brochures. Homeowners also received the brochure, which teaches them efficient planting and irrigation of a home landscape, and the efficient use of outdoor water and correct planting methods.

Lessons Learned

Budget inexperience for the production of videos and copying of DVDs left that portion of the project unfunded. The money, after reallocation and reduction of funds from the original request, was put into the printing budget of the 50,000 brochures.

Contact Information

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Georgia Green Industry Association
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211 Queen Road
Epworth, GA 30541
706-632-0100
706-632-0300 Fax
sherry@ggia.org
www.ggia.org

Additional Information

An electronic version of the brochure is included below.

Begin with a waterSmart Design

Landscape and irrigation designs should complement one another. A waterSmart landscape is more than just water-efficient. It's a landscape that has been carefully designed, properly installed and managed to reduce pollution, improve conservation and strive for year-round beauty. A waterSmart landscape is designed to be functional and water-efficient. Existing vegetation that is well-established and desirable should be preserved and incorporated into the design since it generally does not require supplemental irrigation. The principles of a waterSmart landscape are outlined in UGA Cooperative Extension Circular 930 *Developing a waterSmart Landscape* <http://tinyurl.com/UGAwatersmart>. Incorporated suggestions include: design your landscape to minimize high water-use areas, properly prepare soil, install appropriate plants in the right locations with appropriate sunlight and soils, minimize the footprint of irrigated areas, maximize water use efficiency in irrigated areas, use mulch and grass-cycling when possible, and maintain a conservation ethic to reduce water, fertilizer and pesticide use.

For additional information on saving water in the landscape, see www.conservewatergeorgia.net or call your local county Cooperative Extension office at 1-800-454-UGA1.

Mark Rise and Frank Henning
The University of Georgia
Departments of Crop and Soil Science and Horticulture
and
Chris Butts
Georgia Green Industry Association

Funding provided by the
Georgia Green Industry Association.



Do your part...and be waterSmart.
And remember...the water we save today is an investment in our future!

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Circular 930 / September 2012



Know How and When to waterSmart:



A guide to outdoor watering rules and landscape water conservation in Georgia



Georgia Water Stewardship Act

The Water Stewardship Act is intended to demonstrate Georgia's commitment to the conservation of critical freshwater supplies. This Act was passed to help ensure that Georgia's water supply system can sustainably meet the needs of economic development in the state, while also maintaining adequate flows that satisfy instream and downstream needs. In both Georgia and its neighboring states, the Water Stewardship Act encourages water conservation both indoors and outdoors. The Act promotes indoor water conservation by encouraging the installation of efficient fixtures and equipment. Outdoors, the Act encourages landscape best management practices and efficient irrigation. An electronic copy of Georgia Senate Bill 370 (as passed) can be found online at: www.legis.state.ga.us/legis/2009_10/sams/sb370.htm. This publication is intended to help homeowners ensure that irrigated landscapes follow the Georgia Water Stewardship Act and make the best use of water in the landscape.

Water Sources:

There are no schedule or quantity limits on water use from the following outdoor water sources:

- Capture and reuse of cooling system condensate or stormwater;
- Reuse of gray water;
- Use of reclaimed wastewater; or
- Use of water withdrawn from private water wells or surface water on the owners' property.



Plants do not require tap water that is treated to meet drinking water standards. Capturing and using rainwater, condensate, stormwater and gray water are conservation practices that not only save water, but can also reduce runoff and pollution of downstream waterways. Before implementing any of these practices, be sure to meet all state and local ordinances.

When available, reclaimed wastewater is often provided at a reduced rate that could significantly lower consumer water bills. Using these alternative water sources creates a more sustainable and waterSmart landscape. If you are using a private well or surface water, your water use is not restricted, but it is still important to conserve water wherever possible.

Allowable/Permissible Irrigation:

The Water Stewardship Act does not limit the following types of irrigation:

- Drip irrigation or irrigation using soaker hoses;
- Hand watering with a hand-held container or a hose with automatic cutoff;
- Irrigation of personal food gardens;
- Irrigation of horticultural crops intended for sale, resale or installation;
- Irrigation of athletic fields, golf courses or public turfgrass recreational areas;
- Irrigation of new and replanted plants, seed or turfgrass in landscapes, golf courses or sports turf fields, during installation and for a period of 30 days immediately following the date of installation; or
- Installation, maintenance or calibration of irrigation systems.



While these situations and uses are exempt, it is still important to promote conservation, maximize irrigation efficiency and, where possible, conform to nighttime and evening water use provisions.

Limited Irrigation:

The Water Stewardship Act only permits outdoor sprinkler irrigation between 4:00 p.m. and 10:00 a.m. Irrigating early in the morning reduces water loss due to evaporation and prevents plants and turfgrass from remaining wet overnight, which helps reduce disease and pest problems.

For ornamental trees, shrubs and flowers, using low-volume irrigation such as drips or micro-sprinklers can reduce evaporation by 30% to 50%. Over-sprinkler irrigation. If you are using sprinkler irrigation, be sure that the system is operated and maintained properly to avoid leaks, runoff, applications on impervious surfaces and significant overlap or over-irrigation. If your system is automated, ensure that the controls are set properly and that the system is equipped with a rain shut-off sensor or soil moisture sensors, which prevent system operation during rainfall events or when soil moisture deems irrigation unnecessary. UGA Cooperative Extension publications *Make Every Drop Count Efficient Landscape Irrigation Systems* (Circular 895-5) and *Using Water Wisely with Automated Irrigation Systems* (Circular 870) can help you better manage your existing irrigation systems. Visit <http://tinyurl.com/UGAwatersmart> to find these and other irrigation publications.

Upon application to and approval by the director of the Environmental Protection Division, any political subdivision of this state or local government authority may, for good cause shown, impose more stringent restrictions on outdoor water use.

Schedule Your Irrigation to Make Every Drop Count!

Applying the proper amount of water and scheduling it at the proper time is another key waterSmart feature. Watering in the early morning can reduce evaporation losses and disease pressure because the foliage will not be wet for an extended period. Outdoor water use can easily be reduced by irrigating only when plants need water. A routine, visual inspection of the landscape can help indicate when irrigation is necessary.



Over-irrigation can produce unhealthy plants. Most landscape plants do not need irrigation every day. Over-watering can create problems such as shallow root systems, causing plants to become stressed in adverse environmental conditions. Plants stressed by excessive watering are more susceptible to diseases, insects and weeds.

Rainfall should be the main water source for your landscape whenever possible. The frequency of rainfall and the resulting amount of irrigation needed changes continuously. Plants' water needs are generally greatest in the spring and decline in the fall and winter.

Soil moisture sensors can be installed on some automated irrigation systems. Soil moisture sensors measure the amount of water in a soil and are a management tool that can help to determine when irrigation is necessary.

Irrigate deeply and infrequently, depending on the depth of the root system. Deep, infrequent irrigation cycles can contribute to the development of healthy root systems that can withstand adverse environmental conditions. Landscape plants that are watered every day will typically develop a shallow root system and the plant can become more quickly stressed in hot, dry conditions.

Maintain your system. Leaks and improperly functioning systems can waste a significant amount of water. Fix leaks promptly. Winterize, inspect or have your system evaluated (audited) by an irrigation professional annually.

Conform to the watering schedule imposed by state and local governments. It is important to be aware of current outdoor water restrictions in your community. Unless plants need watering, do not feel compelled to irrigate every day that is allowed.

4. HOMESTEAD PROJECT – SHEPHERD'S HILL FARM – FINAL PERFORMANCE REPORT

Project Summary: This project has been a great teaching tool as the students have been able to learn through hands-on experience in the agriculture arena. In addition to the planning and building of a greenhouse, the students have been involved in growing fruits, vegetables, and herbs. They have been responsible for the upkeep of the garden through the fall of last year.

Project Approach: Students planted, cultivated and harvested from their garden. They also were able to sell some of the herbs and vegetables to the community. We had \$27 income from the sales. This income was immediately reinvested into the program in order to help sustain and grow the project. We also have used the greenhouse to grow plants from seedlings and transplant them into the garden.

We took several field trips to a few different places that pertain to these areas. One trip was to the Clemson Botanical Gardens where a guide explained all the different trees and plants. It was extremely informative to all our students and staff. We also visited the Lazy B Farm, in Statham, Georgia, to learn about beekeeping. This was also a very informative trip for the students and even helped us in making a decision to begin keeping our own bees at Shepherd's Hill Farm. We will be learning not only about the beekeeping, but will also be teaching the girls to harvest the honey.

Goals and Outcomes Achieved: This project was started to aid in the growth of at-risk youth; we wanted them to learn the importance of agriculture in our society, which in turn would promote learning and healing. Hopefully, this should give them vision, purpose and hope as they learn a different way of life.

The students, through their hard work, and fulfillment of their responsibilities, each built better character and a new appreciation for a good work ethic. *Even though all of the funds have been spent, we will try to track graduates after three years of graduating who participated in the project, to see how the project impacted their lives; for example, whether any student went on to higher education in the areas of agriculture and farming.*

During the project, the students were so excited to participate. Many of the students had never had the opportunity to plant a single seed or plant. They were eager to learn. It was after attending the field trip to the Lazy B Farm, that we decided that the girls group home will become involved in beekeeping.

Beneficiaries: The students, their families, and the surrounding community benefited from this project because of the knowledge, understanding, labor, and contact with the outside world involved. All of these things helped to build integrity and character in the students. Hopefully, this project will be a role model for future programs.

Lessons Learned: Construction of the greenhouse was a bigger challenge than we anticipated; we had decided to do all the construction ourselves. We also had some problems getting our water to the site.

Contact Person: Beth Embry, Shepherd's Hill Farm; 706-779-5736;
shepherdshillfarm@windstream.net

5. GEORGIA PECANS HEALTHY BILLBOARD CAMPAIGN – GEORGIA PECAN COMMODITY COMMISSION – FINAL PERFORMANCE REPORT

Project Summary: The Georgia Agricultural Commodity Commission for Pecans' mission is to promote, educate and research Georgia pecans. This project designed, created and installed billboards throughout the state to create awareness of Georgia Pecans as the healthiest nut available. The billboards made consumers, industry, and everyone aware that pecans are higher in antioxidants than any other nut available. Studies suggest that a serving of pecans a day may lower "bad" cholesterol levels, decrease blood pressure, reduce the risk of heart disease, and fight against prostate and breast cancer.

Project Approach: Billboards were purchased promoting the health benefits of Georgia pecans up and down I-75 in Georgia and North Florida. Several growers designed the billboard and Lamar Advertising secured the locations.

Goals and Outcomes Achieved: Approximately 150,000 cars drove by the billboard locations every day, which equals to 54,984,695 cars per year. We heard positive feedback from tourists, as well as the growers. While gathering sales information, it became clear that a measurement using the number of sales by farms closest to the locations of the signs, would not be an accurate accounting of total sale increase. There are few farms close by, and there was no way to determine sales from other locations.

The growers only had a 70% crop last season, but saw record sales and demand; they stated the billboard campaign helped in contributing to this increase. Growers averaged 80 cents a pound more than the previous year, or a 60% increase. The demand and interest in Georgia Pecans and the interest in the health values exceeds anything the growers of Georgia expected.

Beneficiaries: The beneficiaries of this project are the over 600 pecan growers, as well as the tourists and consumers who purchase Georgia pecans (these figures are hard to calculate).

Lessons Learned: Billboard advertising is a very successful type of advertising, reaching hundreds of thousands of drivers every day. We plan on continuing this project in the future.

Contact Person: Marcia Crowley, Georgia Pecan Commodity Commission; 404-656-3678;
buddy@legerandson.com

Additional Information: A picture of the billboard and letters regarding the success of the billboards are included below.



© This design was created by Lamar Advertising and cannot be used for any other advertising purposes. **REPRODUCTION OF THIS ARTWORK IN WHOLE OR IN PART IS PROHIBITED.**
 If you wish to use this design for other media purposes it can be purchased for a one time fee of \$100 and put on a CD for use.

GEORGIA PECANS FIT!
 All Seasons • All Reasons

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www.GEORGIAPECANSFIT.ORG

American Heart Association
CERTIFIED
 Meets Criteria For Heart-Healthy Food

LAMAR

Special Notes:



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Product Size: 14x48
 Plant: 074 • Valdosta, GA
 Account Executive: Lyndi Soles - 229-560-5919
 Wednesday, August 15 2012 D4

SUNBELT PLANTATIONS, INC.

ADCOCK PECAN COMPANY

P.O. BOX 740

TIFTON, GA 31793

April 15, 2011

Tom Stone

Georgia Pecan Commodity Commission

Tom,

Just a note to let you know that the pecan advertisements in our area have really been an asset to our business.

We appreciate the opportunity to advertise pecans and would like to ask that you supply us with two more vinyls for this area: we need one 26X40 and one 26X48 for these signs.

Maybe you could consider adding us to your budget next year as we do own a billboard company. We would be able to beat anyone's prices for our billboard leases with prices starting as low as \$200.00 per month.

Sincerely,



Mace Johnson

General Manager

Sunbelt Plantations, Inc.

Merritt Pecan Company
P. O. Box 39 Hwy 520
Weston, GA 31832

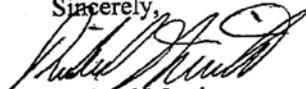
To: Georgia Pecan Commodity Commission
Re: Billboards

April, 14, 2011

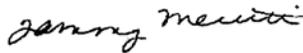
Dear Commission,

We wanted to let you know that we are very appreciative of the billboards that are located on Highway 520. They are eye-catching and we feel that they have benefited our business. Thank you for the investment in the billboards which have been informative for the public and have steered customers in our direction.

Sincerely,



Richard Merritt



Tammy Merritt

Priester's Pecans, LLC
106 Fairview Drive
Perry, Georgia 31069

Dear Sirs,

This letter is in appreciation for the billboards located throughout Georgia. I have received many favorable comments. Customers are expressing their thanks about billboard information that directs them to locations to purchase Georgia pecans. This is a valuable resource for Priester's and your commitment to continue this advertisement for Georgia pecans.

Thank you again and we are looking forward to seeing and hearing from our customers about the billboards.

Sincerely,

Ginger Gregory
Store manager

TO: TOM STONE, GEORGIA PECAN COMMISSION

FROM: BRAD ELLIS, ELLIS BROS. PECANS, INC.

We at Ellis Bros. Pecans feel that the billboard program is one of the best investments our Pecan Commission has done so far. The billboards make the travelers who come to our store aware of the health benefits and the fact that Georgia is "THE" place to buy quality pecans. These factors have played a large part in our resisting the slow down in the economy. We have held on to some degree of growth even in these depressed times.



6. INCREASING PROMOTIONS OF GEORGIA GROWN PECANS – GEORGIA PECAN GROWERS ASSOCIATION – FINAL PERFORMANCE REPORT

Project Summary: The Georgia Pecan Growers Association is continuously promoting Georgia pecans around the world. The Association designed promotional materials that were used at trade shows, health fairs, annual conferences, and pecan grower meetings held around across the nation and worldwide. In addition, the association created, designed, and selected locations for promotional billboards so as to educate and raise awareness of the health benefits of pecans. An informational and interactive website was also designed to continue promoting consumption and visibility of Georgia pecans. The following projects were undertaken to achieve the desired outcomes:

Trade show visuals

Billboards to Enhance Pecan Marketing

International Pecan Promotion

Website for the Promotion of Pecans

Trade show visuals: The Association recognizes the need for trade show visuals and materials to increase awareness of the health benefits and availability of pecans. Professionally designed brochures and visuals were created to capture pecans as a power packed healthy snack. The materials enhanced the healthiness of pecans as heart friendly nuts filled with quality and taste. This project was important and timely in part due to the national concerns regarding our alarming growth rate of obesity. The use of professionally designed brochures and visuals were good tools to increase consumers' awareness of the benefits and availability of pecans.

Billboards to Enhance Pecan Marketing: In a nation where obesity is growing at an alarming rate, healthy food choices need to be promoted. The Association recognized the need to increase the awareness of the health benefits and availability of pecans in the state of Georgia. Pecans are a good source of protein and contain essential vitamins and minerals, including iron, calcium and the B vitamins. According to a USDA study, pecans contain more antioxidants than any other nut. Billboards were created and posted on major highways and express corridors to capture consumers' attention and create a memorable impression of Georgia pecans. This visual tool enabled the Association to provide additional outreach, as well as awareness and accessibility, to consumers and growers throughout the state of Georgia.

International Pecan Promotion: The objective of this project was to increase Georgia pecan sales by participating in international trade shows. The Association recognized the need to educate and raise awareness of the health benefits and potential of the pecan in the international market place as well as continuous promotion of healthy food choices. Participation in international trade shows enhanced one-on-one communication and interaction between vendors and buyers, thereby increasing interest, familiarity and sales of the Georgia pecan. This project was a continuation of work undertaken in 2008 after the realization that pecans were in demand at the

world market. The Association increased efforts to promote and market pecans at the global level by conducting promotional campaigns in various cities and countries which included Spain, Brazil, Chile, Dubai, India, Singapore and China.

Website for the Promotion of Pecans: The website was designed to market Georgia pecans to multiple stakeholders. A website was particularly critical and timely in a challenging national and global economic climate for Georgia pecans to successfully compete locally, state-wide, and around the globe. The objectives of the project were to enhance state, national, and international sales, recognition, and competitiveness of Georgia-grown pecans. Additional outreach, as well as awareness and accessibility to new and beginning pecan growers and farmers and disadvantaged groups of growers were achieved through the creation and materials on the website.

Project Approach: Trade show visuals: The goal of this project was to inform consumers of the health benefits of pecans. Public awareness campaigns were conducted to increase sales and publicity of Georgia pecans. In October 2009, the Association began with the design and development of brochures/visuals. Two trade shows and several meetings were conducted.

Billboards to Enhance Pecan Marketing: The goal of this project was to develop a public awareness campaign leading to an improvement in the health of consumers and an increase in the sale and publicity of Georgia pecans. A survey was produced and administered during fall field day to determine the effectiveness of the billboards.

International Pecan Promotion: The goal of this project was to increase the sales and publicity of Georgia pecans on the world market. To ultimately reach the anticipated global audience, the Association participated in five outbound trade shows and four inbound trade shows that were scheduled throughout the world. Representatives from the Association flew to the trade shows to meet with the in-country representative. Booths were set up to promote Georgia pecans by providing literature, visuals, and pecan samples. A chef was available at many of the trade shows to demonstrate the cooking possibilities of pecans. Due to these promotions, there has been a noticeable increase in the yearly production of pecan sales from 70 million pounds in 2008 to 85 million pounds in 2009.

Website for the Promotion of Pecans: The goal of this project was to increase public awareness of Georgia pecans with the ultimate goal of increasing sales. The Association promoted the website by directly contacting the members in the form of physical mailings, email blasts and notifications, and through the current quarterly magazine. The website was also promoted during marketing tours scheduled throughout the world. The Association launched a comprehensive, resource-based website, www.georgiapecan.org, to serve as a hub for many stakeholders in the pecan industry in Georgia. Continuous monitoring and maintenance of the site has increased the educational and marketing resources that are available to many farmers. The association has received more 200,000 visitors to the site since its creation, with monthly visits to the website ranging from 3,000 to 5,000 hits. The ultimate goal of creating connections between buyers and growers has been further enhanced by the creation of the website, with a Grower's section added.

Goals and Outcomes Achieved: Trade show visuals: Due to these campaigns, a record 85 million pounds of pecans were produced in 2009. Trade show visuals included a 10 x 10 exhibit booth, table drapes, nutritional charts, Fun Fact sheets, portfolios for potential advertisers and business

cards. Awareness of the 2009 pecan campaign continued to grow with each trade show. The beautiful brown background highlighted our logo, "Nature's Health Food," and the Georgia pecans pictured on the visual materials. According to a verbal count of attendees, the number of persons aware of the current pecan campaign liked the new marketing visuals and felt they were an effective way to get our message out.

According to Southeast Farm Press, Greg Fonsah, an economist with the University of Georgia College of Agricultural and Environmental Sciences, "Georgia growers will harvest an estimated 90 million pounds of pecans this year, or 29 percent more than last year. Nationally, production is up 59 percent." Pecan crops alternate years of nut bearing performance. In 2009, the pecan trees produced a bumper crop in comparison to 2008, which was an off year for the trees. Again, in 2010, there was an off year. If you consider this trend, it is not possible to report gains or losses by sales. Sales in the off years will always be smaller due to the trees producing fewer nuts. In 2008, Georgia produced 70,000 pounds of pecans and sold them for \$1.06 per pound. In 2009, the crop increased to 90,000 pounds and was sold at \$1.44 per pound.

The survey developed (*attached*) in order to obtain a measurable outcome regarding the number of persons aware of the current pecan campaign, the number who liked the campaign, the number who bought the product, and those likely to purchase it again, gave no conclusive results. This survey will continue to be placed at trade shows and results tallied. A verbal response from attendees has been very positive, but not measurable.

Billboards to Enhance Pecan Marketing: Out of the 100 surveys administered, 75% of respondents were aware of the billboards, with 63% agreeing that billboards were an effective way to promote pecans. *Attached is a picture of the Georgia Pecan Growers' billboard.* As mentioned above, 2008 was an off year, with 70,000 pounds of pecans produced and sold for \$1.06 per pound. In 2009, the crop produced increased to 90,000 pounds and was sold at \$1.44 per pound.

The attached survey and positive verbal responses gave indications that Georgia travelers and Georgia pecan growers were aware of and identified with the campaign slogan.

International Pecan Promotion: Marketing activities during the past two or three years were designed to take advantage of and encourage the surge in Chinese interest in the Georgia pecan and resulting sales. Marketing activities have also helped identify the major players in China; provided the opportunity to make a general assessment of the market; published appropriate flyers and brochures for Chinese industry; and targeted in-store promotions. Increased presence has also provided the opportunity to discuss market development strategies with several of the major importer/distributors. The rapid growth of the Chinese market appears to be sustainable as more and more people become familiar with the pecan. An estimated 60% of the Georgia pecan production was shipped to China in-shell from the 2009 harvest.

To ultimately reach the anticipated global audience, the association participated in five outbound trade shows and four inbound trade missions that were scheduled throughout the world. Representatives from the Association flew to the trade shows to meet with the in-country representative. Booths were set up to promote Georgia pecans by providing literature, visuals, and pecan samples. A chef was available at many of the trade shows to demonstrate the cooking

possibilities of pecans. A record 85 million pounds of pecans were produced in Georgia in 2009, with 60% of the crop exported to China.

The Chinese market has been underdeveloped by the Georgia pecan industry. In 2002, China imported 2.2 million pounds of U.S. pecans and in 2008, they imported 44 million pounds. The number has steadily increased until at the present time, the U.S. exports 50% of the national pecan crop to China. Funds from grants help growers to exhibit at trade shows in order to develop other foreign markets.

Website for the Promotion of Pecans: Continuous monitoring and maintenance of the site has increased the educational and marketing resources that are available to many farmers. The website was completed in April, 2009. Many emails were received requesting additional information regarding pecan purchases, planting of trees, association membership, and available grants. Other information that GPGA intends to advertise is the Spring Educational Conference and the Fall Field Day event. Attendees and exhibitors will be able to register and pay on-line. The ultimate goal of creating connections between buyers and growers has been further enhanced by the creation of the website, with a Grower's section added. Below is a screenshot of the website.

The website analytical service was changed on January 31, 2011. Previous data is not currently available. The website developer changed provider services and is no longer able to obtain data before the change. *Attached you will find a copy of a printout which is current, and gives the number of hits since January 2011.*

Beneficiaries: Many Georgia farmers have benefited from all the domestic and international promotional and marketing campaigns the Association has conducted. Opportunities are available to the more than 550 pecan farmers in Georgia. An estimated total of 20 pecan distributors have been able to ship their pecans to many international destinations, mainly China.

Lessons Learned: Website for the Promotion of Pecans: The association launched a comprehensive, resource-based website, www.georgiapecan.org, to serve as a hub for many stakeholders in the pecan industry in Georgia. Below is a screenshot of the website. Continuous monitoring and maintenance of the site is critical to ensure that more educational and marketing resources are available to farmers, consumers and various stakeholders.

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Nature's Health Food

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Contact Us

Georgia Pecan Growers Association
201 N. Central Avenue, Ste E
Tifton, Georgia 31793
Phone: 229-382-2187
Fax: 404-393-9298
[E-Mail Us](#)

Welcome

- [Georgia Fall Day is Sept 9th! Click here for more info.](#)
- [Current Pecan Supplier List](#)
- [Pecan Recipes](#)
- [Georgia Cold Storage Facilities](#)

Why Join Our Association?

- Free subscription to quarterly magazine, the Pecan Grower
- Free educational [trade show & conference](#) entry held each year
- Networking resource

Mission Statement

The Mission of the Georgia Pecan Growers Association is to encourage research, education, health benefits and promotion of all phases of production and marketing in the interest of our Pecan Growers in the increasing global

International Pecan promotion - Ever since pecan promotional and marketing campaigns have been introduced in China and many parts of the world, the pecan industry has seen a robust growth in export sales. These marketing efforts have given Georgia pecan producers new venues and means of promoting their products and has resulted in exposure to new buyers and distributors. The informational literature given out at all promotional activities have had lasting pecan awareness. Continual promotional and marketing efforts aimed at creating a larger customer base, are very much needed for the continued growth in export sales of pecans. From the food shows, it was evident that the Association needed to continue educating the world market on the quality of Georgia pecans and define the differences in the product compared to other nuts currently consumed. Furthermore, it was evident that follow-up visits would be primarily important to build a personal relationship in these world markets.

Trade show visuals: Marketing materials used during trade visuals were used to tell the story of Georgia pecans. There was a need to translate the language on brochures and promotional materials into different languages so that consumers could understand in their language. This Association intends to secure funds to conduct this action.

Billboards: More visually appealing billboards need to be developed so that they can be eye catching and consumers recognize the pecan as a healthy nut in and around the State of Georgia.

Contact Person: Janice Dees, Executive Director; Georgia Pecan Growers Association, Inc.; 229-382-2187; georgiapecan@gmail.com

Additional Information: Please see attached promotional material.

Pecan Trade Show Survey



Are you aware of the health benefits of the pecan?

Yes No

Are you interested in learning about healthy products?

Yes No

Have you previously purchased pecans for a snack?

Yes No

Do you use pecans as ingredients in recipes?

Yes No

Will you purchase pecans in the future?

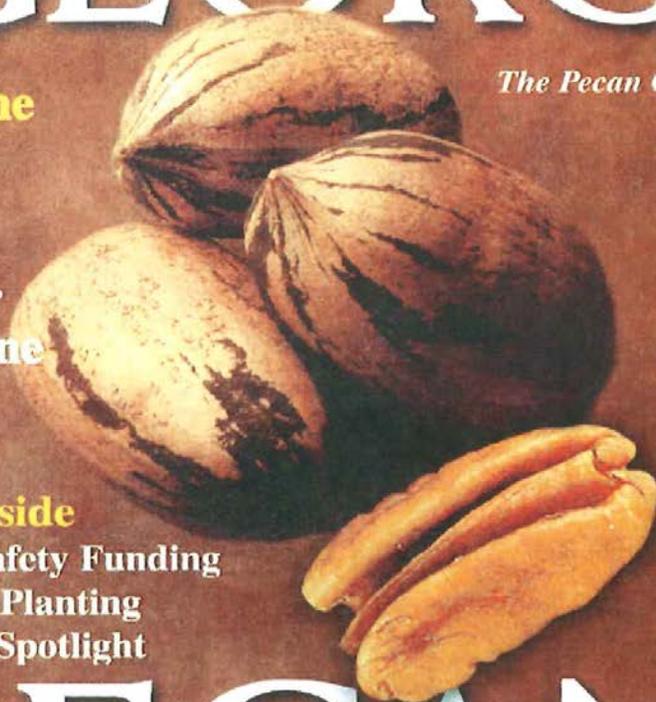
Yes No

Winter 2010

GEORGIA

**Welcome
to The
NEW
Pecan
Grower
Magazine**

The Pecan Grower Magazine
Vol. XXI, No 3



**Specialty
Crop
Block Grant
Program**

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- Pecan Safety Funding
- 1st Year Planting
- Grower Spotlight

**The
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Official Publication of the Georgia Pecan Growers Association, Inc.



The Georgia Pecan Growers Association developed the above billboard through the use of the funds received from the Specialty Crop Block Grant Project beginning in 2009. The billboards were erected on State Highways 84, 82, 520, 301 and 19. There were 12 billboards.

7. BACTERIAL LEAF SCORCH, A DEVASTATING NEW DISEASE IN SOUTHERN Highbush BLUEBERRY – GEORGIA BLUEBERRY GROWERS’ ASSOCIATION – FINAL PERFORMANCE REPORT

Project Summary: The driving force behind the grant was to address the issue of a new disease identified in the rabbiteye blueberry production region of southeast Georgia. The new disease has been named bacterial leaf scorch and is caused by the bacterium *Xylella fastidiosa*. The University of Georgia, College of Agriculture, scientists determined that this disease had the potential to become a major threat to blueberry production in Georgia and especially in the southern highbush varieties. We established a blueberry field dedicated to this project for a long period of time. We do have preliminary results that we have put into “suggestions,” but at this time, we are not in a position to make “recommendations” for the control of bacterial leaf scorch in blueberry.

Project Approach: The first need was to establish blueberry plantings of the two most affected varieties. A two-acre block of Star was planted in a traditional 10 foot x 4 foot production system in soil amended with pine bark. Another block was planted to V-1 in a high density production system with 5 foot x 2 foot spacing in solid pine bark. Both varieties and production systems are very prominent in the blueberry production area of southeast Georgia. These plantings are located at the University of Georgia’s Blueberry Research/Demonstration Farm in Bacon County, Georgia.

The vector of bacterial leaf scorch is the Glassy-Winged Sharpshooter, a large Xylem feeding insect. Our first effort was aimed at controlling this vector with foliar applied insecticide sprays and soil applied insecticide applications. Several compounds at varying rates, timing and combinations have been tested the past two years.

Goals and Outcomes Achieved: Our research has given us enough data to make some “suggestions” for control, but not to make hard “recommendations.” (See the attached “2010 Blueberry Landscape Ecology Study.”) Some suggestions include using Best Agriculture Practices in growing the plants; i.e., do not allow the plants to stress from lack of nutrients, water or other crop protection materials. Use Admire at 14 oz. per acre during May and June. Spray Mustang (two-three applications) when leafhoppers reach their peak; when the planting is no longer viable, switch to varieties that are less susceptible.

The research projects that have been implemented will continue into the future. This grant also has given the Georgia Blueberry Growers' Association (GBGA) not only the ability to research *Xylella*, but other new and emerging diseases as well; the infrastructure is now in place that will be a benefit well into the future.

Beneficiaries: About 300 blueberry growers in southeast Georgia and blueberry growers in other states as well are beneficiaries of this project. The information also has been and will be shared with other land-grant universities.

Lessons Learned: We have learned that there are differing strains of this *Xylella* bacterial disease. It will be very helpful to be able to distinguish the strain that infects blueberries from strains that infect other fruits. So far this has proven to be a formidable task and will require more research.

Contact Person: John Ed Smith, Manager, Blueberry Research/Demonstration Farm; University of Georgia; jesmith@uga.edu

8. GEORGIA CHRISTMAS TREE MARKETING PROGRAM – GEORGIA CHRISTMAS TREE ASSOCIATION – FINAL PERFORMANCE REPORT

Project Summary

The GCTA erected four, 14' x 48' billboards in various locations across the state to promote the Georgia-grown Christmas tree. The billboards emphasized the cut-your-own advantage to Georgia-grown and offer the GCTA website. Each billboard was in place for the months of November and December in 2009, 2010, and 2011. The billboards have been well received and the number of calls to the GCTA phone number has increased two fold.

Project Approach

The project approach taken was to capitalize on the heavy traffic areas of metro Atlanta and the Macon area. By placing the billboards in these heavily travelled areas, we hoped to inform the largest number of citizens about the opportunities available at choose and cut tree farms.

Goals and Outcomes Achieved

The overall goal of the project was to increase the number of Christmas trees sold at choose and cut farms in Georgia. The number of phone calls to the GCTA has doubled over the past three years to a total of approximately 750 during the 2011 season. Hits to the GCTA website have also increased three fold to a total of 37,800 during the 2011 season. The average

increase in sales over the last three years is approximately 12% based on the information reported on the GCTA website by its members.

We had a Florida-bound family stop by to visit a tree farm in South Georgia after seeing the GCTA website on a billboard in Atlanta.

Beneficiaries and How They Benefited

The 100 plus growers of Georgia-grown Christmas trees benefited from the increased awareness as a result of the project. It was important that we market our product on a large scale in order to inform the numerous new citizens to our state of the various farms statewide. Educating the public in Georgia about local grown Christmas trees was very important in order to provide the information necessary to attract additional business to the choose-and-cut Christmas tree farms.

Lessons Learned

Fortunately the project was fairly simple to manage. The biggest lesson learned was how to report and track the grant funds.

Contact

Chuck Berry, President
Georgia Christmas Tree Association
770-602-6003
berrypplace@yahoo.com

9. EAT A GEORGIA RAINBOW – CHILDREN’S MUSEUM OF ATLANTA – FINAL PERFORMANCE REPORT

Project Summary: As an advocate for children, Imagine It! has a history of looking at issues of concern to families and children of Georgia. Georgia’s children rank as some of the heaviest in the country, with about 37 percent of children ages 10 to 17 overweight or obese, according to a 2009 Robert Wood Johnson study, “F as in Fat.” In response to this growing issue, Imagine It! proposed to solve the problem by creating a program that would help us tackle the childhood obesity epidemic one child, one family, and one community at a time. In January 2010, “**Eat a Georgia Rainbow,**” was successfully launched to teach the value of eating Georgia grown foods to the Museum’s audience of children and families throughout the Atlanta community and beyond.

Eat a Georgia Rainbow addressed two issues of concern: the growing incidence of childhood obesity and the need for healthier eating, and the environmental need to support local farmers by buying and eating locally grown foods. Research shows that when young children learn to eat a balanced, nutritious diet, they keep those habits throughout their lives. Growing environmental concerns about decreasing an individual’s carbon footprint make Georgia grown

fruits and vegetables even more important – and delicious! Many of the Museum’s visitors are unaware of the wide range of Georgia crops that are available and where they can purchase them. ***Eat a Georgia Rainbow*** helps to raise that awareness. Through the program’s ongoing activities, webpage and the Museum’s Parent Resource Room, adults are able to find sources to purchase “Georgia Grown” foods. The key objectives of ***Eat a Georgia Rainbow*** are to educate children and their families about: 1) the diversity of Georgia food crops; 2) the importance of a variety of fruits and vegetables in a healthy diet; and 3) the value of eating locally – helping the environment and the state’s economy.

Project Approach: ***Eat a Georgia Rainbow*** was created as an innovative, educational program that teaches young children and their adult caregivers about the importance of eating a variety of colorful, nutrient-rich fruits and vegetables every day for better health. In an effort to reach children and adult caregivers throughout Georgia, the Museum considered three program initiatives to potentially improve the nutritional value and healthy eating habits of children. The Museum staff pulled together a group of advisory partners and began to plan programming, changing its *Fundamentally Food* exhibition inside the Museum, and special event days. The evaluation advisor was brought in, and helped design the evaluation tools for the performance measures. The overall objectives were for children and adult caregivers to learn and to appreciate Georgia grown fruits and vegetables and incorporate healthy foods into their diets, thereby changing their eating habits.

Imagine It! The Children’s Museum of Atlanta is dedicated to addressing issues and topics that are important to children and families and healthy eating has always risen to the top of the Museum’s priorities. Because The Children’s Museum of Atlanta serves a large audience of young children and families, the Museum is often approached by other organizations who wish to convey certain messaging to the Museum’s visitors. Any and all messaging must be screened by the Museum to ensure that it is in alignment with the Museum’s overall mission. Often times when a partnership with an outside institution is launched, other organizations will join in the effort to enhance the impact of the program. This is exactly what occurred with Eat a Georgia Rainbow.

Upon launching the program, the Museum looked for statewide partners to participate in an advisory committee for Eat A Georgia Rainbow which promotes the value of eating Georgia grown fruits and vegetables. The Georgia Egg Commission was suggested to us as a good partner by the Georgia Department of Agriculture and their messaging was folded into the umbrella of Eat a Georgia Rainbow. Based on their outreach objectives, the Georgia Egg Commission created and conducted a program called “eggstravaganza” and donated all food products along with the in-kind services of their program moderator.

The Southeastern United Dairy Industry Association (SUDIA) also approached the Museum and expressed interest in creating a dairy exhibition at the Museum to teach children about the nutritional value of dairy products. SUDIA granted \$68,100 to the Museum to build and display a life size, milkable, dairy cow exhibit and an interactive wall-mounted exhibit that explained the “farm to table” route of dairy products. The opening of the exhibition was held in June (National Dairy Month) and all food products (the give-aways of milk and string cheese) were donated by Mayfield Dairies and Kroger Stores. Georgia Dairy farmers attended the opening to make presentations to Museum visitors and even had a live cow and calf across the street from the Museum in Centennial Olympic Park. The Eat a Georgia Rainbow grant from Department of Agriculture thus had a multiplier effect, allowing the Museum to work with terrific partners who provided great cash and in-kind support to enhance the overarching Fundamentally Food learning zone of the Museum. The overall budget for Eat a Georgia Rainbow is much larger than the funds given by the Specialty Crop Grant distribution. All funds received from the Specialty Crop Grant were spent only on programs highlighting Georgia grown specialty crops as indicated in the program budget of the final report.

Eat a Georgia Rainbow was launched as a full-blown program in March 2010. Pieces of the *Fundamentally Food* exhibition components were updated to include labels that helped guide children and their adult caregivers through the food processing, taking them through the clean, harvested techniques used to transform raw from the “Farm to the Table” and teaching them all about Georgia grown fruits and vegetables, which were easily identified by signature labels. The Museum was excited to have this opportunity of promoting healthy eating for children and adult caregivers that provides an opportunity to increase nutritional value making a difference for a healthier lifestyle.

Exciting programming activities were conducted every Sunday by the Imaginators (the Museum’s professional troupe of actor/educators) which featured ***Eat a Georgia Rainbow*** programming around seasonal fruits and vegetables. They included a list of books to read that highlighted different fruits and vegetables each month (*see below*).

March, April & May - Strawberries and Carrots - "Tops and Bottoms" by Janet Stevens.

June, July & August - Blueberries and Peaches - "Blueberries for Sale" by Robert McCloskey.

September, October & November - Pumpkins - “Pumpkin Pumpkin” by Jeanne Titherington.

Children discovered that many fruit and vegetable recipes taste great! Cooking demonstrations gave children and their adult caregivers a chance to take part in educational activities and games. Imaginators guided families in making different foods from Georgia grown seasonal fruits and vegetables. This activity provided a “new” learning experience that presented children and their adult caregivers an opportunity to talk about nutrition, reinforcing healthy eating lessons with a scoop of fun! When it came to fortifying drinks, families continued their nutritious journey making fruit smoothies from carrots and strawberries; the Imaginators even taught them how to make pumpkin mousse. In parallel with cooking activities, Imaginators

completed an interactive treasure hunt game where families searched out different fruits and vegetables in the *Fundamentally Food* exhibition.

At the end of each activity, families were given “different” specialty recipe cards to take home. These created healthy cooking ideas, especially for busy parents; kid friendly recipes; recipes for kids to help cook or just enjoy eating, and for those kids who are just interested in food and cooking fresh vegetables. ***Eat a Georgia Rainbow*** wants to ensure children and their adult caregivers stay focused on continuing their journey of eating a healthy diet rich in fruits and vegetables everyday for better health.

Other activities this year included special cooking sessions. ***Eat a Georgia Rainbow*** events have occurred five times this year, partnering with various groups. These special events have included:

March 20: Yummy Spoonfuls makes “fruity” popsicles with fresh, locally-grown fruits.

May 15: Georgia Egg Commission’s “Double Yolk” Twins create a hard-boiled “eggstravaganza” with the children.

June 19: Museum’s launches a “Farm to Table” exhibition with a milkable cow funded by the Dairy Farmers of Georgia and featuring free cartons of milk and pieces of string cheese to give away to the visitors.

July 17: Georgia Peach Day – the “Giant Peach” visits the museum and gives fresh peaches to all of the museum visitors.

November 13: Chef Damaul Mitchell conducts a kids cooking class with fresh Georgia Fruits and Vegetables.

Eat a Georgia Rainbow also has its own “page” on the Museum’s website, with resources for families, including links to our partners, links to local farmers’ markets, books to share with children and a link to the kids’ page for the Georgia State Department of Agriculture.

Goals and Outcomes Achieved: ***Eat a Georgia Rainbow*** has three key goals to educate children and their families:

The diversity of Georgia food crops.

The importance of a variety of fruits and vegetables in a healthy diet.

The value of eating locally – helping the environment and the state’s economy.

The ***Eat a Georgia Rainbow*** advisory committee took these three goals and helped the Museum to further design the programming and exhibition components that addressed the goals.

For example, the exhibition components installed in the museum highlighted Georgia fruit and vegetable crops in three separate locations, guiding the children and their adult caregivers from farm to table. The Museum’s primary audiences are both “readers” (4-8 year olds) and pre-readers (0-5 year olds). For those audiences there are images that matched the food to the word, as part of the exhibition component. From the “farm market” where children could pick

out their “fruits” to the “home,” where they could put them together in a salad, the exhibition created a complete experience for the children. In addition, to further the message for the parents, the ***Eat a Georgia Rainbow*** page on the Museum site gave them a list of Georgia grown fruits and vegetables and even locations around the metropolitan area to purchase them! These museum exhibits were visited by over 200,000 children and their families over the past year.

In order to encourage our audiences to try new foods and vegetables, the weekly programming featured seasonally grown fruits and vegetables, gave the children and their families a chance to make something, a strawberry carrot smoothie, or a pumpkin mousse, and try the new food. Our advisory committee members highly recommended this approach, saying that children need to try new foods several times in order to learn how to “like” the new taste.

Imagine It! strongly believes in evaluating all Museum programming against the original goals. In the case of ***Eat a Georgia Rainbow***, the Museum would conduct measurements in two areas:

Goal	Performance Measure	Benchmark
Educate families and children about the variety of Georgia fruits and vegetables.	The number of people attending each of the special event days relating to Georgia fruits & vegetables: 350 per day.	Attendance figures for those days.

We are currently finishing up an on-line survey to submit to our visitors who attended the ***Eat a Georgia Rainbow*** programs. The attendance goals for the programs were greatly exceeded – as you can see below. We projected an average of 350 per special event day and had an average of over 800 people attending each event.

March 20: Yummy Spoonfuls made “fruity” popsicles **(809) attended**.

May 15: Georgia Egg Commission’s “Double Yolk” Twins created a hard-boiled “eggstravaganza’ with the children **(766) attended**.

June 19: Museum launched a “Farm to Table” exhibition with a milkable cow funded by the Dairy Farmers of Georgia and featured free cartons of milk and pieces of string cheese to give away to visitors **(697) attended**.

July 17: Georgia Peach Day – the “Giant Peach” visited the Museum and gave fresh peaches to all of the Museum visitors **(1159) attended**.

November 13: Chef Damaul Mitchell conducted a kids’ cooking class with fresh Georgia fruits and vegetables.

All grant funds submitted were expended. In addition, our partners have been very generous in donating food to the program. The Egg Commission donated eggs and gave coupons to visitors;

the Georgia Peach Commission gave away over 1,000 peaches in July; and Chef Mitchell's entire supplies for his program were donated by his Georgia produce suppliers.

Beneficiaries: The major beneficiaries were the young children and their adult caregivers who participated in the program. Hopefully, what the children learned will be carried over to their adult life.

Lessons Learned: The data sources for the evaluation were our Museum attendance figures and evaluation forms filled out by our actor/educators, and the Imaginators. In addition, our outside evaluator, Julie Sharpe of Sharpe Solutions, attended two ***Eat a Georgia Rainbow*** programs and made suggestions for improvement, which we implemented. One suggestion was a "shorter" story and the other suggestion was to use "big" books for the storytelling, in order to maintain the attention span of our young audience. As a result, we selected a shorter fall story and created a "storyboard" enabling the children to comprehend easier.

Overall, the program performed better than expected. Our attendance was higher and more people attended the special event programming. We are still waiting on the results from the on-line survey, but ***Eat a Georgia Rainbow*** has done a great job of reaching the intended target audience. Studies show that children remember the colors of the rainbow at an early age! While they won't find a pot of gold at the end, they will find delicious, fresh and healthy food choices they will love. The ***Eat a Georgia Rainbow*** program is seen as an important catalyst for change in its efforts to combat childhood obesity by helping children learn more healthful eating habits.

Contact Person:

Laura Angel, Director of Development

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langel@childrensmuseumatlanta.org

Additional Information: ***Eat a Georgia Rainbow*** has grown in popularity since its launch in March 2010.

Print version of "Eat a Georgia Rainbow" web page.

Sign advertising "Eat a Georgia Rainbow."

Imagine It! The Children's Museum of Atlanta

Website page for

Eat a Georgia Rainbow



Georgia has a wide variety of great fruits and vegetables to help children and adults in our state to eat healthy! As you may have heard, the healthiest (and most fun) diet is a colorful one, with foods from every color of the rainbow – from blueberries to tomatoes and from carrots to cucumbers. All of these foods are grown in Georgia.

Ongoing Series

Eat a Georgia Rainbow is an ongoing series of Sunday programs at Imagine It! We are celebrating Georgia grown fruits, vegetables and other crops in our Fundamentally Food exhibition. During each growing season, programming will feature crops that can be harvested in the spring, summer, fall or winter. Our [Imagimators](#) will guide your children through a fun treasure hunt, storytelling program, and cold cooking activity. Check our [programming calendar](#) for Eat a Georgia Rainbow programming. Check out the chef's recipes from our [Cooking with Colors](#) classes with Chef Damaul Mitchell.

Special Features

On special days guest chefs will come in and help your kids to create their own delicious foods from seasonal fruits and vegetables.

More fruits and vegetables that are grown in Georgia will be added in [Fundamentally Food](#), our permanent learning zone. Labels will help children learn the path from farm to store to table. Have fun helping your young chef create fabulous meals and role play serving them to you in our House.

Eat Local

[Click here](#) for an interactive list of farmers' markets.

Partner Websites on Healthy Eating

[Georgia Department of Agriculture's Kids page](#) – a fun quiz on Georgia fruits and vegetables and a chart showing what grows in each season. Go to the Department's website and click on the Kids page Link

[Georgia Organics](#) has great information on where to buy locally grown foods and vegetables to cook at home – or where to dine out!

The [Georgia Egg Commission](#) has a fun site with recipes and other information.

The [Nibbles for Health Newsletter](#) from the US Food and Drug Administration has some great tips for getting children to try new foods – that sometimes it take a few tries (someone said as many as 11).

GPB's [Georgia Weighs In](#) – GPB is joining with other critical partners in Georgia to grow our wellness community and connect resources around the topic of obesity.

Children's Books about Healthy Foods

"The Old Grey Lady and the Strawberry Snatcher" by Molly Bang

"Tops and Bottoms" by Janet Stevens

"The Carrot Seed" by Ruth Krauss

"Blueberries for Sal" by Robert McClosky

"Corn is Maize - The Gift of the Indians" by Alike

"Watermelon Day" by Kathy Apelt

"Pumpkin, Pumpkin" by Jeanne Titherington

"Johnny Appleseed" by Steven Kellogg

"Monsters Don't Eat Broccoli" by Barbara Jean Hicks

Our Eat a Georgia Rainbow program was featured in an [article](#) on the front page of the Living section of *The Atlanta Journal-Constitution* on Sunday, April 11, 2010!

This program is made possible by the **Georgia Department of Agriculture Specialty Crop Block Grant Program/Farm Bill Collaborative** with Georgia Organics and the Georgia Egg Commission.

[Go Back](#)

This page is found at: http://www.childrensmuseumatlanta.org/about/eat_a_georgia_rainbow

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10. DISCOVER GEORGIA'S WINE COUNTRY – WINEGROWERS ASSOCIATION OF GEORGIA FINAL PERFORMANCE REPORT

Project Summary

Using funding from the USDA Specialty Crop Block Grant, the Winegrowers' Association of Georgia (WAG) developed an in-depth plan to increase consumer awareness of Georgia grown wines, and also to introduce and invite consumers to visit wineries located within Georgia.

Because of the poor economy for the past five years, Georgia and Northeast Georgia have seen many jobs lost and a large decline in revenue. The vineyard/winery industry (which prior to Prohibition, Georgia was the 5th largest producer of wines in the United States) in Georgia is now beginning to experience new growth. WAG has ten winery/vineyard members, each with a minimum of five acres of French Vinifera grapes and each producing more than 1,000 cases of wine made from French Vinifera Grapes.

The presence of people coming to Georgia to plant Vinifera grapes is a strong sign they believe in grape growing in Georgia and this will ultimately boost the growth of this industry in Georgia. The growth of the wine industry will have a ripple effect upon other industries such as tourism, jobs, land purchase, and equally important, revenue to the state.

The combination of our new Facebook page, video, and more reliance on web links has proven to be the most cost-effective way to reach customers who are primarily in the metro Atlanta/Athens market, are 28-55 years of age, and are technologically connected. This project was hugely successful as we were able to better identify our demographics and most importantly, how to effectively reach them.

Project Approach

The overall objective of this project was to develop a greater awareness throughout Georgia and neighboring states of the excellent Georgia grown wines being produced and encourage consumers to visit Georgia wineries. In order to achieve this objective, WAG developed an advertising campaign that consistently put the wine industry in front of the targeted demographics—metro Atlanta—those visitors coming through the airport who are most likely not to leave immediately (versus the business traveler). Our approach was to ascertain the most effective way to reach our target markets, which have been the greater Atlanta Metro area as well as the Athens, Georgia market. While we continue our print mediums, we have also ventured into the social mediums with a Facebook page and the filming of a video that has been aired in lodging facilities and on general cable in the northeast Georgia wine region.

As an initial step in our strategy for this grant, we interviewed three marketing firms through the assistance and recommendation of our local CVB and Economic Development councils to engage the firm that would best suit the needs we had relative to our Branding and Awareness

building programs. Upon completion of the meetings and interviews, it became clear that our budget would not allow us to engage the firms that would best represent our needs.

Therefore, WAG embarked upon the avenue of pricing billboards along GA 400 and I-985 in the north-bound direction from Atlanta. Our timing, given the slow economy, allowed us to take advantage of the expertise of these firms in what draws the public's attention in the timeframe they have to view a billboard at 55 plus miles per hour. We took that information and engaged a web-site developer who had a graphic artist who developed a photograph that we could use in several different ads, along with a slogan many of the Georgia tourism groups have used which is, "*Discover Georgia...*" With this photograph and slogan, we set up two billboards in May of 2010 running six-month contracts on both boards which recently ended.

We also registered the URL for DiscoverGeorgiaWine.com. Once the billboards were up and the print ads ran, there was an increase in hits to the website. While we could not depict which medium was responsible for the increase in traffic or what combination was the cause, the fact is we did see a substantial increase to the site and inquiries relative to the members.

Additionally, we took the photo which has become the background for advertisements we have run since and placed ads in *Northeast Georgia Living*, *Southern Living*, *Georgia Magazine*, *Athens Magazine*, as well as ads in the in-flight *Magazine of Air Tran Airlines*. Print ads in themselves are hard to gauge, as we began the development of a "Brand" by using the same ad in all publications which tied in with the billboards.

WAG also created a commercial/infomercial, which was aired on the Visitors Information Channel (VIC) in seven counties in northeast Georgia and parts of North Carolina. The commercial shows a clip of all ten WAG-member wineries, each approximately 10-12 seconds with a view of the property/tasting room and a "voice over" narration about the winery. The VIC airs mainly in lodging facilities, B&Bs and similar locations. The channel also airs on general cable in the seven counties.

All of the above activities put Georgia wine and wineries in front of consumers. The membership of WAG realized a year-after-year increase in visitations and business.

Goals and Outcomes Achieved

Goal #1 – Increase visitation to wineries within the north and northeast region by 50 percent from the 2007 baseline of 36,000 visits. Each winery provided a monthly report of traffic through their tasting rooms. All wineries showed an average increase in visits of 35-45 percent.

Goal #2 – Increase awareness of vineyards/wineries through strategic placement of advertising in destination/travel magazines, placement of brochures in travel and retreat stops along highways entering Georgia, and billboard advertising. For tasting events, we intended to measure the effectiveness of this advertising by comparing pre-event reservations with actual attendance. This type of data turned out to be impossible to determine; the turnout for most events was so great, we could not quantify the information.

However, we could compare this year's visitation numbers with last year's. In the Spring Highway event, we had a 30 percent increase over the previous year. As for the WineFest weekend, we show a 15 percent increase in attendance; but actual sales were up by 23 percent. The Winter Wine Highway event was approximately 10 percent less in attendance over the previous year; we think this was due to the fact that we moved the event one weekend earlier, which turned out to be "Rivalry Weekend" for SEC College football.

With respect to the billboards, we signed six-month contracts on the two boards, which were to be up from March-October. It was actually May before both boards were up and by that time we missed the Spring Highway Event (held in March). We did, however, obtain an additional three months or more exposure on the boards given the fact that there were not a lot of customers in need of billboard space.

The electronic mediums were by far more successful than traditional print advertising in making consumers aware of Georgia vineyards/wineries. The video produced was very successful in that there was a link attached to WAG's website which assisted people in their planning and in many cases was viewed as people were in transit to the area. With the use of Google Analytics, we were able to measure the impact of various sites we joined and their direct link impact to our wineries. The major link directing traffic to our website was Georgia Tourist Guide.com. When analyzing the Google Reports, this medium was second only to Google, ahead of all other browsers.

Goal #3 – Increase the sales of Georgia wine, which will increase state revenue. Based upon a recent study from the University of Georgia, with the percentage of increase in winery visitation, there was approximately an additional \$22.5 million in total economic impact, which became an additional \$1.05 million in tax revenue to Georgia.

Beneficiaries

Convincing more people to visit Georgia vineyards/wineries not only helps the merchants and other businesses, but the state is also rewarded through the increase in revenue. When we bring visitors from other states, that revenue has the ability to become exponential. As mentioned earlier, a recent study through the University of Georgia reported that 51,214 visitors visited Georgia's 24 Wineries in 2007, of which 82% traveled less than 100 miles to their destination. The report also states that the Georgia wine industry created a \$45 million dollar economic impact to Georgia with the state and local governments receiving \$2.1 million in tax revenue. In creating that economic impact, the industry also created 430 jobs.

Lessons Learned

Challenges we faced included hiring a professional firm to assist us with the development of a strategy and plan. We realized the cost of a professional marketing/advertising firm was out of reach; therefore, we had to find another way to utilize other resources to accomplish our goals. This set-back only put us behind schedule about 60 days. We still managed to execute an advertising campaign that enabled us to hit our desired markets at the time originally planned.

Another challenge we faced was that because of the price we negotiated for the VIC program, we had only two days to shoot all ten wineries, and the weather did not bear favorably for many of the shoots. However, we were able to put together a very well-done piece and stay within our budget. Because of the extra work in the studio, it took a couple of weeks longer than expected and we missed airing in the month of October.

Contact Person

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11. CONSERVATION DISTRICTS' FARM TO SCHOOL PROGRAM – GEORGIA ASSOCIATION OF CONSERVATION DISTRICT SUPERVISORS – FINAL PERFORMANCE REPORT

Project Summary

GACDS established a Farm to School program with 2009 Specialty Crop grant funds to enhance the competitiveness of Georgia's fruit and vegetable growers and increase school children's access to fresh fruits and vegetables. To begin the program, the Walton County Soil and Water Conservation District and Walton County Health Care Foundation hosted a luncheon for community and school system leaders to encourage their participation in the district's educational activities; there were no specialty crop grant funds utilized for the luncheon. Feedback was gathered on the partners and schools' ability to increase the students' access to fresh fruits and vegetables. GACDS worked with the University of Georgia Center for Agribusiness and Economic Development to design a farmers market promotion program for the soil and water conservation districts (SWCDs). To help foster the public's knowledge of agriculture and promote Georgia grown products, GACDS joined Team Agriculture Georgia and participated in the Georgia Agritourism Conference.

Project Approach

Training sessions were held to develop the SWCD supervisors' capacity to assist their districts' farmers with marketing. A Farm to School breakout was conducted at the GACDS Annual Meeting, during which Georgia Organics spoke about their Farm to School activities and the UGA Center for Agribusiness and Economic Development

educated producers on their marketing options using tools such as the Georgia Market Maker. The Farm to School program was mentioned at GACDS summer group meetings to remind supervisors of their role in promoting Georgia agriculture and encourage their outreach to schools and community groups. The Conservation Partnership Supervisor Training (conducted by GACDS, the Natural Resources Conservation Service, and the Georgia Soil and Water Conservation Commission) focused on the production and marketing of specialty crops. Attendees visited a hydroponics greenhouse to learn about the direct marketing of lettuce to restaurants and other customers. A visit to another family farm covered the planting and harvesting of vegetables, as well as the direct marketing of produce at their roadside market.

The Walton County SWCD supervisors worked with two schools to increase the consumption of fresh fruits and vegetables. Fourth and fifth graders planted and maintained the raised beds full of fruits and vegetables at Atha Road Elementary School. Students learned about the importance of fresh fruits and vegetables in a healthy diet as they harvested and prepared their own produce. Extra produce that was not used during the salad celebrations was sent home with children and teachers. Students at Monroe Area High School are in the early stages of developing the school garden. They have worked with the SWCD district, teachers, and NRCS to reclaim the outdoor classroom on the grounds and designed a fruit and vegetable portion of the garden. Program updates on district outreach were shared with the seventy-five audience members at the Walton County SWCD Annual Meeting and volunteers were solicited for the ongoing Farm to School activities.

Goals and Outcomes Achieved

Project activities that achieved the performance goals and measurable outcomes for the project were:

2009 Local Farmer and School Staff informational session (approximately 20 participants)

2010 GACDS Annual Meeting Farm to School breakout session and exhibit (27 participants in breakout; approximately 260 total)

□2010 GACDS Supervisor Training meeting project update during the Conservation Education Session (approximately 60 participants) and tour

□Participation in the 2011 Farm to School Meeting held by Georgia Organics (26 participants)

The unexpected retirement of two long-time SWCD supervisors and school system changes affected the implementation of the program at the Walton County level. Due to decreased manpower, focus was shifted from a system-wide approach to more intensive involvement at two schools. In response to current budget restrictions that cut out field trips for most schools, the district directed support to the gardening programs on Atha Road Elementary school grounds. Students from the fourth and fifth grades of Atha Road Elementary school participated in weekly lessons on growing food and the benefits of eating locally grown foods.

GACDS will continue the statewide promotion of Georgia grown fruits and vegetables. Farm to School outreach efforts will be enhanced with the new tabletop exhibit and briefcase displays. The displays will be employed at the Annual Meeting, Supervisor Training, group meetings, and field days. Starting in January, supervisors will be able to check out the displays from their GSWCC region office to publicize their district programs at community events. GACDS has also conducted other events that support locally grown food and farm-to-school programs, including: a tour during the Annual Meeting in January 2011 to highlight the Bethesda School in Savannah, where students operate an organic garden and greenhouse to supply the school lunchroom, local restaurants, and a weekly market; a Small Farmers Conference in April 2011 that promoted locally grown food production and sales; a Junior Master Gardener course, with a focus on local food production, at JJ Harris Elementary School in Athens, Georgia from January to April 2011; and Walton County and Oconee River SWCDs held a local growers meeting in September 2011 to promote participation in a local farmers market and a farm-to-school program in Walton County. Improvements and additions to

the GACDS website are ongoing, and the board will continue to seek funding for the implementation of the farmers market promotion program in partnership with UGA.

Due to the budget restrictions of the Walton County School System and the necessary redirection of the garden project, GACDS was unable to reach the projected 1,800 elementary school students during the grant period; however, GACDS will continue to educate students on the importance of locally grown food and the nutritional benefits of eating fruits and vegetables.

An increase of sales of locally grown fruits and vegetables to the school system could also not be measured during the grant period; however, the goal of increasing the awareness of the benefits of a farm-to-school program was reached through the 2009 informational session of local farmers and school staff. The fruit and vegetables used in the salad celebrations (activities that allowed students to try new and/or different produce) were either grown at the school or donated by the local farmers; therefore, there were no sales to record. The school system is now set up to purchase locally produced food through Royal Produce, which supplies 41 school systems with produce. Due to the current bid process used by Royal produce, large volume requirements and food safety standards are implemented, thereby restricting the purchases from the small local farmers; therefore the small local farmers would be limited to selling directly to classrooms for tasting events/activities and providing insight on farm production. Furthermore, the school system's nutrition director reported that Royal Produce defines "local" as all of Georgia and the touching states; therefore, produce sales from local Walton County farmers could not be extracted from the schools purchase records.

On average two ARES teachers from the fourth and fifth grades used the outdoor classroom on a weekly basis to integrate elements of the science curriculum such as

plants, health, and nutrition. This means that more than ten percent of the ARES students are familiar with the inner workings of the school garden as well as the hands-on lessons in planting and caring for it. With the outdoor classroom being integrated into the science curriculum, the students would have been tested on this information during science classes; however due to time and curriculum limitations, a separate test was not given on just the outdoor classroom and nutrition lessons. Additionally, test scores from the science classes were not available to be reviewed. Students were encouraged to share with their parents the fruit/vegetable garden and its purpose, as well as explore the option of planting their own family gardens using the ideas and procedures they learned. Teachers and administrators noted a sense of excitement among the students/classes involved, which translates into an overall understanding of the purpose of the project.

Beneficiaries

Local Farmers benefited from F2S Program by being publicized at all meetings held by GACDS. The soil and water conservation district supervisors benefited from the F2S Program by attending meetings about farm-to-school programs and participating in a tour of a farm currently involved in a farm-to-school program. Over 75 elementary school students benefited from F2S Program through lessons taught and gardens installed at Atha Road Elementary and JJ Harris Elementary schools. An additional 1,200 students benefited from access to the outdoor classroom gardens installed at these two schools. High school students at Monroe Area High School also benefited from the F2S Program with participation in the planning stages of a school garden.

Lessons Learned

The 350 soil and water conservation district supervisors learned about the importance of supporting and promoting locally grown fruits and vegetables to their communities

and local school systems. Over 1,200 elementary school students learned about the benefits of eating locally grown fruits and vegetables, how to create gardens, and grow vegetables. Through informational sessions both local farmers and school staff learned about the farm-to-school program.

Upon completion of the grant, we now realize that the increase in sales from local farmers to the school system should have been a long-term goal rather than a short-term goal. Taking into account the growing season, school year, educational process and institutional changes needed to measure success, a long-term approach is more realistic.

Contact Person

GACDS President Danny Hogan

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Additional Information

Attached:

photos of Atha Road Elementary salad celebrations to promote locally grown food; JJ Harris Elementary outdoor garden and 2010 Supervisor Training tour







12. INCREASING GROWER PROFITABILITY THROUGH EXPANDING MARKET SHARE – GEORGIA WATERMELON ASSOCIATION – FINAL PERFORMANCE REPORT

Project Summary: The project's purpose was to inform the general public of the health benefits of eating watermelon, and to highlight the economic benefits of supporting local farm family agriculture. The project was designed to also highlight and focus on the benefit and availability of local 'Georgia Grown' melons.

Project Approach: The activities performed to accomplish the goals outlined above included:

In-store promotions at local and regional retailers to promote local area watermelon growers. The original grant called for 22 in-store promotions. During the months of May to August there were 27 in-store promotions, over 42 days (some were two days in length).

The in-store promotions varied by the day of the week for the months May through August 2010. However, most of the promotions were four to five hours in length from 10 AM - 2 PM or 1 PM - 5 PM. During the 27 in-store promotions:

The average customer count during the times of the promotion was 523, with an average sample distribution per store of 128. This meant we reached approximately 25% of the customers with a sample and with best estimate, over 50% of the customers noticed the promotion in process. A total of 3,456 samples were distributed in the promotion.

On the days the promotion was in the store, a total of 473 melons were sold, averaging 17.5 melons per store. While most produce managers would not release exact sales numbers and provide comparisons, the managers did say they saw sales increase from 20% to 35% during the in-store promotion.

Appearances at Media Promotional Events. There were personal appearances and media interviews by the Georgia Watermelon Association Queen. The original proposal was for ten events; there were actually 12 media events as part of the promotional grant.

Numerous opportunities to speak to print and electronic media.
Reached over 5,000 people attending promotional events.

Promotions at Georgia Welcome Centers. Originally planned for two days each at four Welcome Centers, due to staff coordination the Welcome Center promotion included five days at two Welcome Centers (Fort Oglethorpe and Savannah).

Ft. Oglethorpe – estimated more than 3,000 visitors/day stop at this Welcome Center. During the four-hour promotion, we estimated over 500 were in the Welcome Center and 164 (33%) received a melon sample and information about the nutritional value of watermelons.

Savannah – estimated more than 1,500 visitors/day stop at this Welcome Center. During the four hour-promotion, we estimate over 250 were in the Welcome Center and 58 (23%) received a melon sample and information about the nutritional value of watermelons.

Major Event Promotion In Conjunction with the Atlanta Braves. A day originally planned to be only a personal appearance by the GWA Queen at an Atlanta Braves game to celebrate National Watermelon Day, turned out to be a two-day event over the 4th of July holiday with watermelon samples, seed spitting contests, media interviews/promotions and the Braves' official broadcast announcers highlighting watermelons during their 'play by play' commentary.

Approximately 80,000 people attended the two games and thousands of those fans passed by the GWA tailgate at the entrance gate to Turner Field. Over 3,600 watermelon samples (10,800 bite size cubes) were distributed during the two-day event.

Turner Field, home of the Atlanta Braves, has over 500 monitors throughout the stadium concourses, concession areas and restrooms so fans can keep up with the game while they are away from their seats. Information about the game, player stats, opposing team stats, etc., begin airing two hours before game time, so there is approximately five hours of air time on these monitors for each game. As the information/game is aired, there is a banner ad that covers 1/3 of the screen area on the monitors for sponsors.

During the month of July, Georgia Watermelon Association was a sponsor and had a 10-second 'You Just Can't Hide the Goodness of Georgia Watermelons' ad that aired every three minutes on all 500 stadium monitors. This coverage gave Georgia Grown melons over 51,000 10-second impressions per game or one-half million (510,000), 10-second impressions during the month of July.

Goals and Outcomes: The primary goal of this project was to increase the sale of Georgia watermelons during the Georgia growing season. This was accomplished. The melons sold in 2010 increased from 2009 by more than 70,000,000 lbs. The number of truckloads shipped out of Georgia also increased from 13,719 in 2009 to 15,477 in 2010. Unfortunately, due to weather conditions and over supply, the average price to growers fell by 34.4%, from \$0.148 in 2009 to only \$0.097 in 2010.

The secondary goal was to raise the awareness of the health benefits of consuming Georgia watermelon, which also helps strengthen the long-term economic stability of the state's watermelon industry. This was accomplished through promotions, media appearances and marketing.

Beneficiaries: The beneficiaries of this project are the watermelon growers and the consumers. The melons sold in 2010 increased from 2009 by more than 70,000,000 pounds. The number of

truckloads shipped out of Georgia also increased from 13,719 in 2009 to 15,477 in 2010. The broad-based promotions exposed thousands of consumers to the good taste and healthy benefits of watermelons.

Lessons Learned: This project was highly successful. Unfortunately, the status of the market can have a positive or negative effect on the price and demand of watermelons. Hopefully, the promotions completed from this project will have a positive effect on the demand of watermelon in the upcoming season.

Contact Person: Charles Hall, Executive Director; Georgia Fruit and Vegetable Growers Association; 706-845-8200; chall@asginfo.net

Additional Information:

IN-STORE PROMOTIONS

EVENT - LOCATION	DATE
Sutherland's Food Show	5/05-06/2010
Piggly Wiggly Food Show	5/10-12/2010
Harvey's - Albany	6/01-02/2010
Harvey's - Thomasville	6/4-5/2010
Harvey's - Cordele	6/9/2010
Harvey's - Hawkinsville	6/11/2010
Harvey's - Cairo	6/16/2010
Harvey's - Cochran	6/18/2010
Kroger - Macon	6/21/2010
Harvey's - Ft Valley	6/23-24/2010
Piggly Wiggly - Eufaula	6/29/2010
Harvey's - Adel	6/30-01/2010
Harvey's - Bainbridge	7/7/2010

Piggly Wiggly - Columbus	7/8-9/2010
Kroger - Atlanta	7/10/2010
Harvey's - Americus	7/14/2010
Piggly Wiggly - Ft. Benning	7/15-16/2010
Kroger - Peachtree City	7/17/2010
Robbins AFB Commissary	7/26-27/2010
Harvey's - Sylvester	7/28/2010
Piggly Wiggly - Thomaston	7/29/2010
Piggly Wiggly - Eufaula	7/30-31/2010
Harvey's - Valdosta	8/07-08/2010
Piggly Wiggly - Phenix City	8/10-11/2010
Harvey's - Moultrie	8/14/2010
Harvey's - Valdosta	8/21-22/2010
Harvey's - Douglas	8/27-28/2010

27 In-Store Promotions

MEDIA PROMOTION EVENTS

EVENT - LOCATION	DATE
WSST - TV Savannah, GA	2/5/2010
AG Kick Off Awareness	03/15-16,2010
Depot at the State Capitol	500 - 600 attendees (including media)

Ag Day Recognition	04/27-28/2010	
Thomasville, GA	350 plus attendees	(including media)
Cordele Watermelon Festival	6/3/2010	
Cordele, GA	300-400 attendees	(including media)
WALB Fox 13	6/17/2010	
Albany, GA		
WALB Noon Show	6/17/2010	
Albany, GA		
WMAZ	6/21/2010	
Macon, GA		
Indy Race	07/25-25/2010	
Indianapolis, IN	Thousands of attendees	(including media)
	Distributed truckload of samples	
Governor Perdue's Fish Fry	8/6/2010	
Perry fairgrounds	300 attendees	(including media)
UGA Watermelon Feast	08/13-14/2010	
Athens, GA	200-300 attendees	(including media)
Agriculture & Patriotism	09/10-12/2010	
Rochelle, GA	100-150 attendees	(including media)

Fresh Festival - U.S. Capitol

09/13-17/2010

Washington, D.C.

300-400 attendees (including media)

13. INCREASING SOUTHEASTERN SPECIALTY CROP COMPETITIVENESS BY IMPROVED RISK MANAGEMENT TOOLS – GEORGIA FRUIT AND VEGETABLE GROWERS ASSOCIATION – FINAL PERFORMANCE REPORT

Project Summary

The fruit and vegetable industry in Georgia is valued at more than one billion dollars at the farm gate. This project was designed to provide more research, education and consumer marketing in order to give our southeastern growers strategic opportunities to improve their production practices and mitigate other risks.

The project had five major components to address specialty crop grower needs.

- **Education:**
Support for the educational program (more than 55 hours of seminars and training) at the 2010 Southeast Regional Fruit and Vegetable Conference in which producers listened to speakers addressing the latest in production techniques, management practices, marketing opportunities and regulatory compliance.
- **Traceability and Food Safety:**
Food safety and produce traceability consultation and communication via website information and on-the-farm consultation.
- **Industry Communication 'Clearinghouse':**
Communication to specialty crop producers to make them aware of programs, loans, informational conferences and other activities that would enhance their knowledge and increase the competitiveness of their farming operations.
- **Multi-Discipline Research:**
Research to address producers' emergency needs for pest, disease and economic information on issues of critical importance.
- **Increasing Fruit and Vegetable Market Share:**
Increasing awareness of Georgia produce by direct communication with the retail chain buyers to get more produce on the grocery shelves, and with foodservice distribution companies to broaden purchases by institutional establishments and restaurants.

As mentioned in the title, the objective of this project was to increase the competitiveness of

the specialty crop grower in Georgia by improving the risk management tools available. Based on the accomplishments and measurements of this grant, we can say that it was successful.

Project Approach

The approach of project was to address each of the five components as outlined in the original Work Plan included in the application.

- **Education:**
Coordinate the educational program at the SE Regional Fruit and Vegetable conference; more than 55 hours of seminars and training.
- **Traceability and Food Safety:**
For this component the project included on-farm consultation, website information and a day-long educational training program on traceability.
- **Industry Communication 'Clearinghouse':**
A communication professional was hired to provide producers with up-to-the-minute information on programs and opportunities of interest to them.
- **Multi-Discipline Research:**
Three research projects were funded to provide fresh and accurate research to specialty crop producers.
- **Increasing Fruit and Vegetable Market Share:**
GA GROWN was promoted at the 2009 Produce Marketing Association Fresh Summit in Anaheim, California, and two farm tours were held for retail produce buyers.

Goals and Outcomes Achieved

The primary goal of this project was to increase the competitiveness of southeastern specialty crop producers through five different components that provided improved risk management tools. Each of the five components was achieved by the following activities and Outcomes Achieved.

- **Education:**
The Southeast Regional Fruit and Vegetable Conference was held on January 7-10, 2010 in Savannah, Georgia and offered 57 hours of educational programming, workshops and a trade show with 250 companies. Over 2,200 Georgia and southeastern growers and agribusiness professionals attended the conference. Attendees gave the conference a rating of 3.4 (on a scale of 4.0) for value of conference based on cost and time.
- **Traceability and Food Safety:**
The grant provided farm safety consultation to growers to secure or reauthorize farm certification under the Georgia GAP program. The training and consultation offered through this increased the number of farms certified under the Georgia GAP program from

68 to 73 (7.4% increase). In addition to the five new GAP certified farms, 130 blueberry farms were audited by a GAP trained auditor and received a 'modified' GAP approval.

The grant also provided for a full day 'product recall' workshop that was held in August, 2010 with 24 growers attending; and the GA GAP website was updated with additional information offered to growers.

- **Industry Communication 'Clearinghouse':**

A Director of Information was established and the GFVGA website updated with informational pages to improve member communications.

Database software was installed on the GFVGA website to identify growers of various fruits and vegetables to facilitate the Director of Information communicating with growers based on farm size, commodities grown and geographic region for marketing alerts, production updates and informational surveys.

In addition to the database software, a mapping system was included that will show grower locations, address, contact information and commodities grown. This will aid both consumers looking for a local grower and retail buyers who may be looking to find new growers or supplement their current orders.

- **Multi-Discipline Research:**

Three research projects were funded to provide the latest research to specialty crop producers.

- Chlorine Gas Seed Treatment Against Bacterial Leaf Spot.
- An Evaluation of Direct and Indirect Economic Losses incurred by Georgia Fruit and Vegetable Producers in the Spring of 2011.
- European Pepper Moth Emergency Trapping Project.

- **Increasing Fruit and Vegetable Market share:**

GA GROWN was promoted at the 2009 Produce Marketing Association Fresh Summit in Anaheim, California, with over 12,000 retail buyers attending. In addition, two retail buyer tours were held; one was held in the spring of 2010 with nine produce buyers visiting eight different growing operations during the tour. In the spring of 2011, 15 produce buyers visited nine different growing operations during the three-day tour.

Beneficiaries and How They Benefited

The beneficiaries of this project are the southeastern specialty crop producers who have more risk management tools developed through the education, consulting, research, information and promotion materials developed and expanded as a part of this grant.

Lessons Learned

There were many lessons learned and positive outcomes achieved as noted above.

Contact person for the project:

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8. Additional Information

14. PROMOTING GEORGIA'S VIDALIA ONION – VIDALIA ONION COMMITTEE – FINAL PERFORMANCE REPORT

Project Summary:

Part of this project was to design and build a museum to educate and entertain an existing in-and out-of-state tourist audience and to further market the Official State Vegetable, the Vidalia® onion, by expanding brand equity. The Vidalia® Onion Museum Committee (VOMC) professionally recorded hours of oral histories and production video; gathered countless artifacts including photos, news clippings, farm equipment and other memorabilia; compiled reams of factual information; secured a site, museum consultant, contractor and staff; sought funding and built the exhibits.

Exhibits illuminate the sweet onion's economic, cultural, and culinary significance by walking guests through: how Vidalias were discovered; where they can be grown; why they are sweet; why they are state and federally protected; how farmers and researchers test endlessly to increase disease resistance, yield, shelf life, sweetness; and why fans from local cooks to nationally acclaimed chefs love Vidalias. There is even a "living exhibit" and kids' room.

Because of the proliferation of sweet onions on the market, the significance of teaching all consumers why Vidalias are unique is more important and timely than ever; Vidalias have gone from the lone pioneer of sweet onions to one of more than one hundred names now available on the global market. The museum will be an outlet for new and younger audiences, from kids traveling with their families to students visiting as part of the state school curriculum, to learn about Vidalias and what makes them unique.

The other part of this project was updating the Vidalia® Onion website. The website gets thousands of visitors each month, but the site had become dated and was not in touch with today's technology and the interaction expected by today's consumer. An Internet site in this era represents the first contact point many prospective clients/users have with an organization. This project sought to redesign and update the Vidalia® Onion website, VidaliaOnion.org. The project was needed to make the first impression of Vidalia onions and the Vidalia growers and packers the best possible, thus encouraging more retail sales and consumer purchases of Vidalia onions. The Committee examined the interface and layout of the site with its website team to transform the site into one that is more interactive and visually appealing and that reflects the most appropriate Vidalia brand image, therefore maximizing marketing potential and boosting sales.

Project Approach:

The City of Vidalia owns the rights to the Vidalia® Onion Museum; City Council voted unanimously to grant the Vidalia® Onion Museum Committee (VOMC) permission to plan and build the Vidalia® Onion

Museum. Grant monies awarded were used to complete exhibit installation, the final step before the facility can open to the public.

Ted Cornett and Leigh Campbell-Taylor of MindMade Communications/ ExhibitCraft Studios completed final exhibit drawings and drafted the final exhibit copy to be approved by the VOMC early 2010. They edited a documentary video for VOMC approval. In May 2010, actual construction and installation of exhibits began; the fabricated exhibit stations, (e.g., soil cross-sections, miniature graders) installed artifacts collected, produced graphics (e.g., growing region map), developed interactive computer databases, etc. VOMC planned related marketing activities around the grand opening.

The Museum is in a City building housing both the Vidalia Area Convention & Visitors Bureau and the Vidalia® Onion Committee (which markets Vidalias nationally), and conveniently next door to the area Chamber of Commerce. The VACVB staff oversees the museum, and assists guests by setting up tours, answering questions, etc. The VACVB markets the Museum in its printed literature, billboards, and other marketing efforts. Guests have access to the VOC staff and resources such as Vidalia recipe and information brochures and Vidalia souvenirs. The directors of both organizations serve on the Museum Committee—VOC director is chairperson.

The City has an existing Vidalia® Onion Museum account and oversees all financial transactions. The City will also be responsible for ongoing building maintenance and upkeep costs. The VOMC will continue to meet after opening to discuss any needed improvements or maintenance, marketing, traffic information, etc. VOMC will report to the Vidalia City Council after meetings.

The VACVB will promote the Museum as a destination tourist spot for educational tours and field trips, a stop in conjunction with other Vidalia area tours, local day trips, church & other organizational trips, a stop-off for travelers to Savannah, Macon, Atlanta, and Florida, a destination for national travelers, and a must-see for the thousands of people in town for the annual Vidalia Onion Festival.

The Vidalia® Onion Committee (VOC) will, as part of its national Vidalia onion marketing campaign each year, also promote the museum, including prominent placement on the www.vidaliaonion.org website.

Each year, the growers and packers of Vidalia onions invest money to market the Official Vidalia Onion website, www.VidaliaOnion.org, to both consumers and retailers. These marketing efforts have driven the number of visits up each of the past five years and made the site #1 for “Vidalia onion(s)” on popular search engines. In May and June 2009, the site had almost 25-thousand unique visitors seeking recipes, storage advise, product availability, cooking tips, purchase information, grower/handler directories, processed product information, etc. Yet, the site had maxed out its marketing potential.

A Web team under VOC supervision has completed site improvements including:

- Update overall look and feel - create a site using current and new content that is more user-friendly and user-engaging and which uses newer Web technologies to keep users interested in wanting to come back to the site.

- Larger product imagery, with Flash and animations. Better utilize professional food and product photography.
- Update videos to be in flash format - currently requires Windows Media - will create a "Vidalia Video Player" to appear on all pages under "View Vidalia Videos."
- Update site to use JavaScript "In-frame Pop-Ups" so viewers don't have to continue to click on buttons and leave a page to then come back.
- Yumion Section—more content dedicated to Yumion mascot with visual art and story.
- Ability for VOC staff to update key sections - Full edit ability through a CMS (Content Management System) tool, with multiple user ability and access so users will have more power to update certain sections. Examples: video upload capability, "recipe of the week," new event photos, fun Vidalia quotes, etc.
- Vidalia blog/comments sections for fans to post their favorite recipes, cooking tips, etc.
- Social Media links
- Permanent contest pages. The VOC has an annual contest—trivia, recipe, etc.—but has to pay each year to rebuild this section.
- Archive of past contest winners—a log of who has been a part of the success of Vidalia.

Goals and Outcomes Achieved:

We were losing potential tourism dollars for the State of Georgia and lacked a permanent outlet for marketing the world-famous onion to new and younger audiences; this grant made it possible to solve these problems with two successful projects.

According to the director of the Vidalia Area Convention & Visitors' Bureau (VACVB), impact studies show travelers seeking information and tourist destinations pertaining predominately to the Vidalia onion bring in \$26-million, conservatively, to middle Georgia each year. The annual Vidalia® Onion Festival alone brings in 75,000-100,000 people looking to be educated about and entertained by the Vidalia onion. Marketing the Vidalia® onion, Georgia's Official State Vegetable, through a dedicated museum will not only increase these tourism figures but also trickle down into increased onion sales and support of the industry.

Having its own museum will give credibility to the importance of Georgia's Official State Vegetable and serve as an excellent marketing vehicle for the crop, the industry it supports, the communities in the 20-county growing region, and the State itself. Short-term, funds will support construction of museum exhibits that will immediately provide to existing museum audiences an educational, entertaining, and highly sensorial experience. Intermediately, by having a central source where the comprehensive story of Vidalia onions can be shared, the museum will provide a marketing hook to reach new, expanding audiences. Long-term, it will serve as a permanent homage to a humble industry that grew to be the state's #1 vegetable crop and shines as an agricultural icon.

The mission of the first project was to construct the Vidalia onion story from the ground up, literally, for the purpose of better preserving and expanding the brand equity of this unique Georgia specialty crop and to increase related Vidalia onion tourist revenue for the State. Tourists from around the globe can

now learn about Georgia's famous state vegetable at the newly opened Vidalia Onion Museum. Since its grand opening spring 2011, travelers and tour groups have flowed through the facility daily. The Vidalia® Onion Committee has successfully marketed the tourism destination that teaches people about the pioneer sweet onion. Results in just the first few months include:

- 500 newspaper articles, magazines, television and radio broadcasts to date
- 150-million media impressions and counting within first six months
- Top wire services attended the grand opening or have visited to report on the museum including Reuters, Scripps, and the Associated Press
- Articles in *USA Today*, *Washington Post*, *Chicago Sun-Times*, *Chicago Tribune*, *Atlanta Journal Constitution*, *Miami Herald*, CBS News, ABC News, Yahoo! Finance, AOL Travel, and other top markets.

Whether they have read an article about the museum or are just coming through because they recognize the namesake Vidalia, Georgia, on the map, travelers are no longer disappointed. And, the brand equity in Vidalia onions, which can only be grown in South Georgia, continues to rise exponentially with each article and more educated visitor.

The museum is owned and maintained by the City of Vidalia and housed in the same building as the Vidalia® Onion Committee, Vidalia Area Convention & Visitors Bureau and Vidalia® Onion Business Council. The 1,300-square-foot space offers guests a truly unforgettable interactive experience. It's filled with an array of educational exhibits that highlight the sweet onion's economic, cultural and culinary significance. Exhibits include:

- **“Pioneers, Problems and Promise”**—This exhibit takes guests through the Vidalia onion's humble beginnings. From Depression-era pioneers who began growing onions seeking a new cash cow to the first modern marketers who began selling Vidalia processed products like sauces and salad dressings, guests will learn how the onion's “sweet” history started.
- **“Recipe for a Vidalia Onion”**— With a vast hand-painted 3D mural on display, this exhibit shows guests exactly what makes America's favorite sweet onion so sweet.
- **“Protecting a Name and its Fame”**—This exhibit tells the story of the onion's fight for its name. Visitors will learn about the struggle and steps taken to ensure the integrity of the real Vidalia onion.
- **“A Year-Round Job”**—This exhibit gives guests a glimpse into what it takes to produce these prized onions each year. From planting to picking and all that happens in between, Vidalia onion farmers have the harvesting down to a science.
- **“Onion Town”**—Paying homage to the town for which the vegetable was named, this exhibit notes how the city celebrates the onion. From festivals and cook-offs to beauty queens and cookbooks, the city of Vidalia incorporates the vegetable into everything it does. Visitors will also learn about the economic impact the Vidalia onion has on the state.
- **“Vidalias in Pop Culture”**—This exhibit gives guests the scoop on Vidalia's popularity across the country and across time. From playing a part in *CSI: Miami* to being featured in bestselling books, the Vidalia onion has truly been the star of the show.

- **“Modern Marketing”**—This exhibit walks visitors along the Vidalia onion’s marketing route over the years. From the first farmers’ word-of-mouth method to a 2010 partnership with DreamWorks Animation, the onion’s ever-growing popularity proves there has always been something to talk about.
- **“On the Menu”**—This exhibit includes information about the many celebrities who have voiced their love for Vidalia onions. Visitors will find out what folks like Julia Child, Bobby Flay and even the Clintons have to say about the sweet onion pioneer.
- **“Sweet World for Kids”**—This hands-on exhibit was created with kids in mind. The museum’s youngest visitors will get the chance to learn about the production of Vidalia onions as well as meet Yumion, the colorful mascot who is so popular he has his own Facebook page and book line.
- **“Living Exhibit”**—This exhibit allows guests to see the real thing actually growing in the smallest registered Vidalia onion field right in front of the museum.

The grand opening of the Vidalia Onion Museum in conjunction with the annual Vidalia Onion Festival and 2011 harvest was a huge success. More than 200 people attended the historical event that included a speech by Georgia Commissioner of Agriculture Gary Black, ribbon-cutting ceremony and lunch from an all-star team of chefs including:

- James Beard Award-winning chef **Jeffrey Buben** of Vidalia restaurant in Washington, D.C.
- “Top Chef” Fan Favorite **Kevin Gillespie** of Woodfire Grill in Atlanta, Ga.
- Award-winning chef **Gerry Klaskala** of Aria restaurant in Atlanta, Ga.
- “Top Chef” contestant **Tracey Bloom** of Ray’s at Killer Creek in Atlanta, Ga.
- “Southern My Way” cookbook author **Gena Knox**

The Vidalia Onion Museum is located at 100 Vidalia Sweet Onion Drive, Vidalia, GA. The museum’s regular operating hours will be Monday through Friday from 9 a.m. to 5 p.m. with Saturday hours available for tours. We are still in the process of setting up a tracking system to generate data for monthly seasonal, yearly, and festival foot traffic.

The Vidalia® Onion Committee (VOC) also decided to have a Website redesign in order to: (1) reorganize and focus the overall design and content of the site; (2) create a central location allowing visitors to easily share their love and dedication to the Vidalia Onion Brand; (3) use that central location to better market the Vidalia Onion Brand to potential purchasers, both retail and consumer; and (4) manage site content internally on a regular and monitored basis.

These revisions were necessary to make the site more interactive, faster-downloading, and visually-stimulating for consumers. And, revisions will give VOC staff the capability to update photos, videos, and information without going to the web team. For example, the VOC currently has to pay the web

company every time a grower changes a phone number, address, or email instead of being able to make this simple change internally through an administrative web page.

The Vidalia® Onion Committee website was rebuilt in 2010 from the first image to the last word of text to make the site less copy heavy and more food focused and consumer friendly. The popular recipe database was made more user friendly, moved front and center. The Committee's first foray into social media appeared: links to FaceBook, Twitter, and You Tube to bolster Vidalia onion marketing messages going out to parents, children, bloggers, and media. But, what really made the new site exciting was that it was built to allow the Committee to highlight its annual marketing campaigns, including 2010's wildly successfully "Ogres & Onions" partnership with DreamWorks Animation.

One of the elements specific to the 2010 campaign was "Shrek's Hunt 'n Peel" online Vidalia trivia contest—similar to an Easter egg hunt—that revealed kid-focused Vidalia trivia, health and seasonality messages. That online consumer contest had almost 45-thousand entries, five times the previous Vidalia contest record. Mid-April to mid-August (Vidalia season) the website had 77,847 visitors who viewed an average 3.71 pages; 78.92% were new visitors. In those same months 2009, the old site had just 43,530 visitors.

Beneficiaries:

Georgia's Official State Vegetable, the Vidalia® onion, is the pioneer of all sweet onions. Statistically proven "America's Favorite Sweet Onion," it provides jobs for hundreds of farm and related industry workers in the 20-county growing region, stimulates Georgia's economy as one of its top vegetable crops per farm gate value each year, and represents a third of all sweet onion sales annually nationwide.

Studies show each tourism dollar turns seven times in the local economy; this museum now encourages travelers to buy their gas here in Georgia, stay at our hotels, shop at our Wal-Mart and then return home, where they will more than likely never buy an onion other than Vidalias when they are in season. That brand loyalty means more sales for one hundred growers and packers, and in turn more business for every box, bag, label, ventilation, processing, fertilizer, seed, or other business in the industry that does related business in the state.

The Vidalia producers, packers and related industry, the many communities within the tourism ring around the city of Vidalia, and the State of Georgia all benefit through: increased brand recognition, increased sales of Vidalia onions, increased tourism dollars.

Hotel/Motel tax dollars increased 29.1% from \$43,644 to \$56,332 within two months of museum opening. We are tracking tourists with log-in books and there is an increase of both regular tourists signing in and the number of tours the VACVB is setting up. Tourist traffic is also coming from all over the country, from CA to NY, and shows a definite increase in out-of-state traffic. Visitors show up daily as opposed to what was more weekly traffic before.

Lessons Learned:

They truly will come if you build it. Seldom is the day when tourists do not come through, and they all find something uniquely informative or entertaining. The “living exhibit” in front of the building where “city slickers” can actually see and smell the onions growing is a favorite among all, as is the interactive onion grader/sizer in the kids’ room.

Whether they have read an article about the museum or are just coming through because they recognize namesake Vidalia, Georgia, on the map, travelers are no longer disappointed. And, the brand equity in Vidalia onions, which can only be grown in South Georgia, continues to rise exponentially with each article and more educated visitor.

The website has become even more a part of the Committee’s integrated marketing strategy, and the users have increased exponentially over what was expected by the overhaul. Emails from consumers complimenting the site have been an exciting result of the monies used to revamp the Vidalia site.

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15. PROMOTION OF GEORGIA BEEKEEPERS – GEORGIA BEEKEEPERS ASSOCIATION – FINAL PERFORMANCE REPORT

Project Summary: This project's purpose was to promote the Honeybee and beekeeping industry to the people of Georgia, including the use and consumption of Georgia honey and honeybee-related products. We were very successful in doing this. Emphasis was also made on the fact that it is a healthy food product, which should increase sales.

Project Approach: We targeted, and will target, three important events taking place in 2010, as well as in 2011: (1) Georgia National Fair, in Perry, Georgia; (2) Sunbelt Ag Expo, in Moultrie, Georgia; and (3) Georgia Farm Bureau, Annual Membership Meeting, on Jekyll Island, Georgia.

We also targeted the Georgia Beekeeper Association's meetings.

There were honey tasting events across the state. Participating consumers noted that locally produced Georgia honey had excellent flavor and was ranked above store brand honey by comparison. There was also an increased awareness of varietal honey produced in Georgia, such as Sourwood Honey from the Blue Ridge Mountains and Tupelo Honey from the Savannah and Ogeechee River Valleys.

There were educational events conducted by the Georgia Beekeepers Association and affiliated local associations that reached over 2,300 individuals statewide. The impetus of this educational outreach was to increase public awareness of the benefit of honeybees to the environment and as a first line defense against the spread of Africanized honeybees.

Goals and Outcomes Achieved: Expected Outcomes Met Under State Plan For Georgia Honey:

- i) Awareness of the quality and flavor of Georgia honey was heightened by honey tastings conducted across the state. Participating consumers noted that locally produced Georgia honey had excellent flavor and was ranked above store brand honey by comparison. There was also an increased awareness of varietal honey produced in Georgia such as Sourwood Honey from the Blue Ridge Mountains and Tupelo Honey from the Savannah and Ogeechee River Valleys.
- ii) Consumers demonstrated a preference for locally produced Georgia Honey as a result of participating in the honey tasting events. Store brand honey was ranked as a lower preference item. The consumers' awareness and ability to recognize quality and identify Georgia-produced honey by reading product labeling was improved. Overall sales of honey decreased slightly due to the economic downturn and decreased disposable income on food items considered to be luxury items. Consumers continued to purchase Georgia honey as a preference item, but did so by purchasing smaller quantities (smaller container size).

- iii) Educational events conducted by the Georgia Beekeepers Association and affiliated local associations reached over 2,300 individuals statewide. The impetus of this educational outreach was to increase public awareness of the benefit of honeybees to the environment and as a first-line defense against the spread of Africanized honeybees. Participants in programs reported on verbal post program surveys that their knowledge gain concerning the benefits of honeybees to their community was significant. Many reported that “urban myths” pertaining to the aggressiveness and unfriendly behavior of the honeybee were dispelled. They also reported a surprised realization that the honeybee industry in Georgia covered such a broad gamut of the industry at large, and that Georgia was one of the leading producers of queen honeybees, package bees and beekeeping equipment in the nation.

Expected Outcomes of Improved Delivery of Georgia Beekeepers Association Meetings:

- i) The Georgia Beekeepers Association experienced a 26% overall attendance increase at annual meetings due to better communication and delivery of information facilitated by grant dollars.
- ii) Increased program attendance allowed for improved dissemination of knowledge, gained through a broader base of information being transferred back to the community level.
- iii) Visual aids and informational handouts improved the overall delivery and understanding of research-based information delivered at the Georgia Beekeepers’ regular educational meetings. Surveys were conducted post program via “Survey Monkey.”
- iv) Georgia Beekeepers Association membership rose from a low of 137 in 2008 to a high of 189 members at the close of 2009. Membership is projected to meet or exceed 200 members in 2010.
- v) In 2009, three new local Beekeeping Associations were organized and recognized by the Georgia Beekeepers Association. They are: the Beekeepers of Gwinnett County (80 members); the Oglethorpe County Beekeepers Association (31 members); and the Bartow County Beekeepers Association (39 members). Each of these local associations received promotional information from the Georgia Beekeepers Association under the 2009 grant. See materials list under, “Fund Expenditures to date” below.

Fund Expenditures to date:

- i) Georgia Beekeepers Association Fall Meeting, Pine Mountain, Georgia, September 27-28, 2010. Grant Expenditures for this event: promotional materials from National Honey Board - \$300. There were 180 in attendance.

- ii) Oglethorpe County Beekeepers Association, Lexington, Georgia, October 23, 2010. Honey promotional event/honey tasting. Distributed promotional materials- \$50 expended. There were 112 contacts made.
- iii) Honey promotional event and honey tasting, Georgia Farm Bureau Annual Meeting, Jekyll Island, Georgia, December 6-7, 2010. Grant Expenditures for this event: promotional materials from National Honey Board- \$160. There were 487 individual contacts.
- iv) Promotional materials were purchased from the National Honey Board. These materials include:

Light & Fresh-Brochure details the healthful aspects of honey and includes eight new honey recipes in detachable recipe card format.

Red Carpet Ready—Honey has been used for centuries as part of a healthy skin care regimen and it continues to be used today in manufactured and homemade products for skin and hair care. In this brochure, the National Honey Board has partnered with celebrity esthetician Christopher Watt to share the secrets to the beauty of honey.

Honey - Pure Energy - This brochure provides a “Natural Energy” message about the carbohydrate composition of honey, and how it can serve as an aid to the exercise routines of athletes. Also includes two high energy recipes as well as honey usage tips.

Honey Simplified: From BEE to HIVE to BOTTLE – This brochure has a strong and simple message. In concise and clear language, it shows how pure honey is produced, extracted and bottled with no additives. “The bottle of honey on your supermarket shelf is nothing more than honest to goodness sweetness the way nature intended.”

From Honey Bees to Brain Freeze - “A Kid’s Guide to Cooking with Honey” - This is a colorful collection of eight kid-friendly recipes, from a Honey Berry Waffle Sandwich to Peanut Butter Play Dough.

The Honey Files: Educational Video and Teacher’s Guide- This 20-minute video and 91-page teacher’s guide will have you and your students buzzing! Designed especially for educators of grades 4-6, these fun, educational materials provide information, classroom activities and worksheets about bees, honey and pollination.

Beneficiaries: The beneficiaries of this project were the Honeybee itself, as well as the beekeepers and consumers of Georgia. Consumers obtained a better understanding of the role the Honeybee plays, and the health benefits of honey. The beekeeping industry benefitted from the growing awareness of their industry by the consumer, which will help increase sales and give them well-deserved recognition.

Lessons Learned: Georgia consumers are open to education about a product/issue when presented with facts and hands-on experience. We should continue to educate everyone in Georgia about the Honeybee and the beekeeping industry.

Contact Person: Keith Fielder, Georgia Beekeepers Association; 706-485-4151; kfielder@uga.edu

Additional Information: To find brochures and promotional information, please visit the National Honeybee Catalog at <http://www.honey.com/images/downloads/NHBCatalog.pdf>

16. INCREASING COMPETITIVENESS OF GEORGIA'S CUT FLOWER INDUSTRY – UNIVERSITY OF GEORGIA – FINAL PERFORMANCE REPORT

1. Project Summary

The specific need addressed by the project is the current lack of competitiveness of Georgia's cut flower industry. Currently, potential for success in growing cut flowers in GA is dependent on producing a flower that can't be shipped in from offshore or that can't be produced and shipped at a better quality than that provided locally. Gerbera daisies are an example of cut flowers that can be locally competitive because offshore gerberas are shipped dry and their "keeping" quality is not as good as Georgia grown flowers that are delivered in water and have a better shelf life. Wholesalers prefer to buy flowers that have been kept moist. Georgia farmers can compete better than offshore producers in this arena, but are limited in production by leafminers that are resistant to insecticides. Recent efforts to control leafminers with biological agents have met with failure because other secondary pests (aphids, mites, whiteflies or thrips) outbreak requiring intervention with insecticides which disrupts biological controls of the primary pest leafminers by killing the biological control agents.

In the Phase I portion of this three-phase project, we investigated the compatibility of pesticides, commonly used against leafminers, mites, thrips, whiteflies, and fungal pathogens, with natural enemies of the leafminer. We also initiated demonstration and training in grower houses and conducted industry training. This project conducted during 2010 provided an excellent foundation for Phase II and Phase III research and outreach conducted in 2011 and 2012.

2. Project Approach

This grant's original proposal was written as three phases: Phase I is included within the 2009 Specialty Crop Block Grant; Phase II is included within the 2010 Specialty Crop Block Grant; and Phase III is included within the 2011 Specialty Crop Block Grant.

The final report for this 2009 grant is for Phase I, so it does not include work in the commercial houses. Introduction into commercial greenhouse production is part of the Phase II plan. That activity will be included in the 2010 grant's final report (although some preliminary findings were included in some of our updates/performance reports of Phases I, II and III).

The educational workshops, presentations at professional and grower meetings, and publication in various outlets, are Phase III goals. However, educational workshops were conducted during every year of Phases I, II and III of the project. The main workshop conducted for the Phase I part of the project was an advanced workshop hosted by the Georgia Green Industry Association in January 2012, at the Annual WinterGreen Conference in Atlanta, Georgia.

The Serpentine leafminer *Liriomyza trifolii* (Burgess) (Diptera: Agromyzidae) is a key pest in protected cultivation of ornamentals and vegetables in general. In greenhouse gerberas, apart from them as primary pests, secondary/ occasional pests like mites (*Tetranychus urticae* Koch), thrips (*Frankliniella occidentalis*), whiteflies (*Trialeurodes vaporariorum*, and *Bemisia tabaci*), aphids (*Myzus persicae*), and powdery mildew causing fungal pathogens (from the genera *Podosphaera*, *Erysiphe*, *Leveillula*, *Golovinomyces*, and *Oidium*) require grower attention. *L. trifolii* is chemically resistant and effective control cannot be achieved by use of pesticides, while secondary pests can. Natural enemies have been successful in controlling leafminer populations where harmful pesticide use has been avoided. Pesticides when used, often disrupts leafminer biocontrol often resulting in excess use of pesticides for ineffective control of pests. We investigated the compatibility of pesticides, commonly used against leafminers, mites, thrips, whiteflies, and fungal pathogens, with natural enemies of *L. trifolii* (*Diglyphus isaea* (Walker) (Hymenoptera: Eulophidae)) and *T. urticae* (*Neosiulus californicus* (McGregor)).

3. Goals and Outcomes Achieved

Expected Measurable Outcomes:

University of Georgia research greenhouses were used to develop compatible strategies to control leafminers, aphids, mites, and thrips that limit production. *All of the details of this research can be found in the attached 48-page manuscript. (See Appendix 2)*

The GOAL of this project is to develop and deploy alternative methods for management of pests limiting cut flower production, specifically gerbera production as the model system.

BASELINE 2009: Insecticide resistant leafminers are unable to be controlled with currently available insecticides.

TARGET 2010: Leafminers can be controlled with biocontrol agents

Results: While commonly used pesticides like abamectin and spinosad were found to cause severe mortality in the natural enemies, others like floramite, pyriproxyfen, spiromesifen, spirotetramat among others were found to be compatible with a biologically-based control program.

Summary of compatibility of pesticides with natural enemies following IOBC guidelines (Stark et al 2007)

*Safety to natural enemies denoted by following legends: D. isaea- #, and N. californicus- **

Leafminer Materials	Miticides	Thripicides	Whitefly chemicals	Fungicides
Harmless (< 30% mortality within 48 h)				
Novaluron #	Clofentezine #		Pyriproxyfen #	Butanone #
Petroleum Oil #	Acequinocyl #		Spiromesifen #	Fosetyl-aluminum #
				Azoxystrobin #
				Potassium bicarbonate #
				Pyraclostrobin #
				Copper Sulfate #
				Piperalin #
Slightly Harmful (30-79% mortality within 48 h)				
Azadirachtin #	Bifenazate # *	Flonicamid # *	Flonicamid # *	Sulfur #
Cyromazine # *	Hexythiazox # *	Cyfluthrin #	Chlorpyrifos #	Rosemary Oil #

Moderately Harmful (80-98% mortality within 48 h)

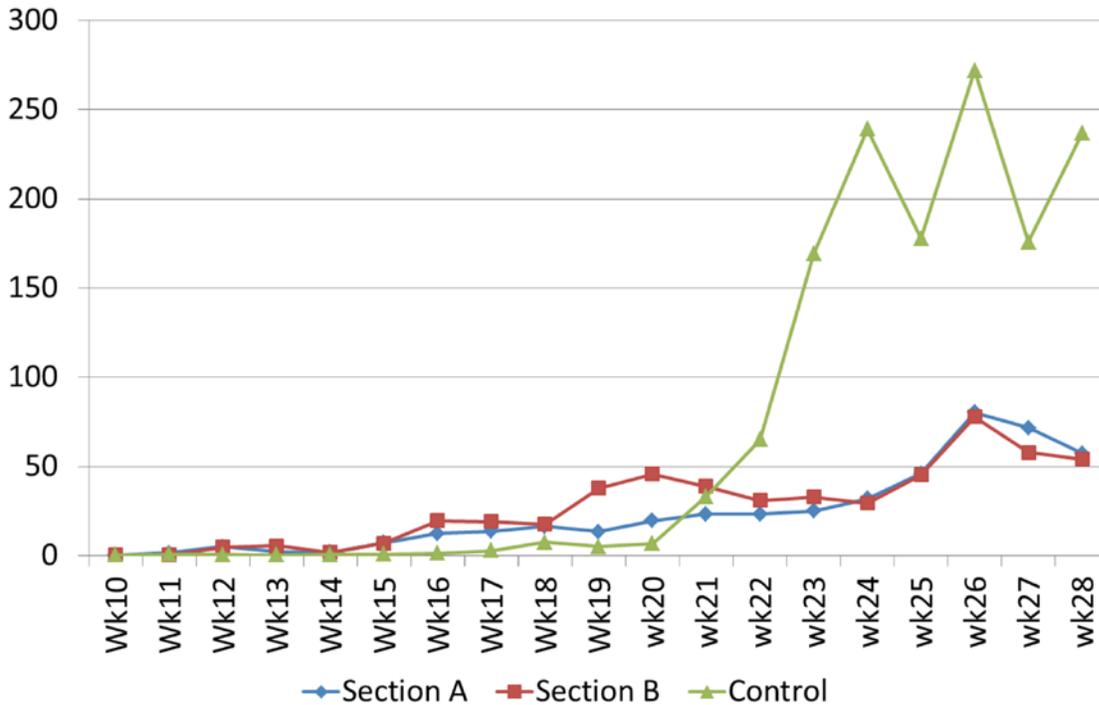
Lambda Cyhalothrin #	Abamectin #	Abamectin #	Kinoprene #	Sulfur *
Azadirachtin *	Acequinocyl *	Fluvalinate #	Thiamethoxam #	
		Chlorfenapyr #	Imidacloprid #	
		<i>B. bassiana</i> *	Lambda Cyhalothrin #	
		Acetamiprid *	Pyriproxyfen *	
			Chlorpyrifos *	

Harmful (>99% mortality within 48 h)

Dinotefuran # *	Spinosad # *	Spinosad # *	Kinoprene *	Fosetyl-aluminum *
Bifenthrin # *	Milbemectin *	Abamectin *	Imidacloprid *	Rosemary Oil *
Lambda Cyhalothrin *	Abamectin *	Cyfluthrin *	Pyridaben *	Azoxystrobin *
Acetamiprid *		Fluvalinate *	Lambda Cyhalothrin *	Potassium bicarbonate *
		Chlorfenapyr *		Pyraclostrobin *

A biologically-based Integrated Pest Management (IPM) program was initiated and compared to a traditional chemical control regime to investigate its biological and financial feasibility in a grower greenhouse in field conditions. Not only was the biologically-based method found to be possible, but also financially feasible. In the illustration below, A and B are under biological control, while C was under traditional management.

Number of Leafminer Mines /50 Leaves



Industry training conducted at the annual statewide Green Industry Conference introduced the project to a broader industry audience.

Information regarding the number of commercial greenhouses using the new pest control strategy; how many educational workshops were conducted and how many growers participated; how many presentations were made; and how many publications were produced, will all be included in the Phase II and III performance reports. Also, some of this information was included in the 2010 Specialty Crop Block Grant, Phase II Final Report.

4. Beneficiaries

The beneficiaries of the project are the greenhouse floriculture/ cutflower industry in Georgia. Georgia’s floriculture industry employs over 9,000 individuals with revenue of more than \$152.5 million. This project will enhance opportunities for cut flower production in Georgia by addressing limiting problems in pest management. Biological and alternative tactics for management of the primary insect and mite pests will be developed and deployed using the gerbera system as a model. The driving factor in gerbera production is insecticide resistant leafminers. These can be controlled with parasitic wasps. This biological control is, however, often disrupted by influxes of other common pests that require chemical control. We will develop simultaneous alternative methods compatible with biocontrol of the primary pest. This system will readily translate to other cut flower production systems.

The project is important and timely because with the advent of resistance to insecticides, there is usually one pest that “drives” the system. In gerbera production it is leafminers, for other crops it may be aphids, mites, whiteflies or thrips. Development of compatible alternative methods for the suite of potential pests of gerbera daisies can be directly transferred to other cut flowers in production making the project broadly relevant. This biologically-based approach to pest management will limit pesticide use and increase potential for cut flower production state-wide.

5. Lessons Learned

In this Phase I project, pesticides compatible with Biological control were identified in the laboratory. Biocontrol of leafminers was also found successful under grower conditions.

6. Contact Person

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7. Additional Information (brochures; photos; website addresses)

There are no links to any online reports or presentations at the present time.



17. GEORGIA CROPS AT EMORY: MOMENTUM FOR MARKET EXPANSION – EMORY UNIVERSITY – FINAL PERFORMANCE REPORT

1. Project Summary

The USDA Specialty Crop Grant was used in 2009-10 to build consumer support for Georgia horticultural crops. Emory University's many sustainability-related efforts have stimulated change across the state—and even the nation—and through the four areas of Emory's Sustainable Food Initiative supported by this grant, we have worked to expand public awareness of the benefits of local, sustainable fruit and vegetable consumption. The four parts are:

- a. Educational Garden Project
- b. Outreach lesson plans and educational materials
- c. Campus farmers market and special events, and
- d. Sustainable Food Fair

Below, each required section of this report will describe the results in those four areas separately. In addition to these four areas of our project, we saw two additional efforts emerge: local crop labels in the dining service and a student-run magazine that featured educational materials on eating locally. A section addresses those efforts at the end. *Also, Section 6, "Tracking of Grant Funds and Use for Specialty Crops," discusses the methodology in ensuring grant funds were used solely to benefit specialty crops.*

2. Project Approach

a. Educational Garden Project

The goal of this component of the project is to expand hands-on gardening knowledge and to expand awareness of Georgia specialty crops. The Educational Garden Project consists of seven small, attractive food gardens along sidewalks and in other well-trafficked locations around campus. Garden teams are recruited each year from faculty, staff, and students. One garden is located close to a commonly-used entrance to Emory Hospital. Others are located near the old train depot, near the School of Public Health, across the street from the Bookstore/Starbucks, beside the Oxford College cafeteria, at Yerkes Primate Center, and near the School of Public Health. The Garden Coordinator, Judith Robertson, is responsible for weekly educational and work sessions with garden teams, coordinates delivery of plants and amendments, and oversees the garden sites. Ms. Robertson coordinates information tables about the garden project at a series of campus and community events, which also spreads the word about Georgia horticultural crops, garden feasibility, and opportunities to participate.

b. Outreach Lesson Plans and Educational Materials

In this component of the project, we created a booklet and web-based document of lesson plans and key educational messages around sustainable and local food, for use in campus marketing activities, by official Emory publications, and by the general public. The approach came from our experience that many consumers are confused by certification and health claims and would like to experiment with buying new foods, but need more information. Our goal was to provide a series of Information Sheets written at the level of the general public that would address those knowledge gaps. The importance of eating locally and seasonally is identified in many of the Info Sheets.

c. Farmers Market and Special Events

This component of the project supported publicity for our fledgling weekly campus farmers market, where the presence of local, sustainable farm products allows consumers ease of purchase, an opportunity to learn about local products, and greatly expands market momentum for Georgia horticultural crops. Julie Shaffer is the market manager, and she worked this year to recruit new farmers and to carry out a series of special market events over the course of the year, to highlight specific Georgia products.

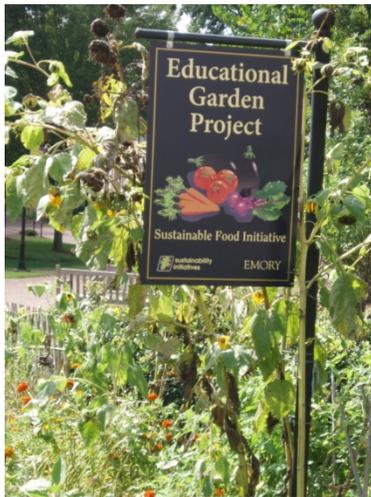
d. Sustainable Food Fair

The goal for this component of the project was to offer a lively fair for the broader Emory community, with music and educational activities around sustainable food and over 40 booths staffed by local chefs highlighting Georgia produce, farmers with food to sell, local stores and cooperatives offering information and samples, and booths as well by nonprofits such as Georgia Organics and EPA, who help spread the word about local and sustainable food. The fair is considered by many to be a highlight of the academic year, and thus knowledge of Georgia specialty crops and the importance of eating locally and seasonally are brought home in creative ways to students, faculty, and staff. For 2009, the fair was held on September 25, from 10:30-1:00 in the center of the campus and the effort was spearheaded by a group of students from the Anthropology Department.

3. Goals and Outcomes Achieved (Also Discussed Within Beneficiaries Category)

a. The Emory Educational Garden Project had three components: train hands-on gardening experience, expand knowledge of Georgia specialty crops, and spread the word about the garden project at campus events. The Project has been very effective in galvanizing interest in locally grown food. The first targets of our efforts are casual passersby, who discover how foods grow and what kinds of new crops to consider buying in stores. Garden work teams this year reported conversations with passersby from all walks of life, international backgrounds, and ages. It's not uncommon, reported one garden worker, for parents visiting the hospital to show their children where food comes from. Another offered a taste of fresh arugula and was rewarded with the exclamation, "That's the most amazing salad I ever tasted." Many faculty, staff, and students also report their interest and delight in watching peas, tomatoes, sunflowers, kale, okra, cucumbers, blueberries, beans, lettuce, basil, and other crops mature and thrive.

Garden work teams remained strong this year and were able to attract new members. The garden planning dinners, held once each semester, helped integrate new members and generate sharing of ideas among the diverse teams. Closer ties with Kirk Hynes in Emory's Horticultural Therapy Program at Wesley Woods Geriatric Center were built to allow his patients to start seedlings in their greenhouse, thereby lowering the costs of planting materials.



The attractiveness of the gardens has led several groups on campus to propose new gardens. Because our funding is limited, we have generally not been able to respond positively to such requests, but we did support a group of students from the School of Theology to create our eighth garden. The Theology Garden is in a location where it receives fairly high foot traffic. Said one worker: "Nearly every time I've been working there, someone who is walking past stops to ask me a question. I've had the opportunity to explain, for example:

- which plants were sowed as seed and which were started in a greenhouse
- why the School of Theology has a garden
- that Emory has several educational gardens, and the university is a leader in this initiative
- why it's important to grow food on 'marginal' land
- who works in the gardens and how to get involved.

We see this student's report as just one example of meeting our goal of spreading the word and expanding the market for Georgia crops.

Events, our third garden goal, were predicted to reach 10 this year, but we actually contributed to 12. See Appendix 1 at end of report for a list.

b. Outreach Lesson Plans and Educational Materials

Our first goal, to get Emory experts to write and edit these materials, was more challenging than we expected. Summarizing the issues around local and sustainable food in accurate and concise language is hard! It required monthly meetings of the Sustainable Food Committee both Fall and Spring semesters to hammer out language that summarized the latest research. The committee has physicians, public health and nutrition experts, faculty in diverse fields, graduate and undergraduate students, as well as food service leaders. We are very pleased with the resulting booklet:

Eating sustainably: an Introduction to Sustainable Food consists of 14 short information sheets on diverse topics relevant to sustainable food. Finalized in May, 2010, a copy was forwarded to the Georgia Department of Agriculture in July, 2010. One of our goals was that it be publicly available, and it was posted on the Emory University website in June 2010, and produced as well in booklet form. We are now getting over 500 hits daily to our website (compared to 100-125 in June 2010); however, we cannot track the hits that are specifically directed to our information sheets. We assume some of this increase in hits is because of our outreach. (Office of Sustainability Initiatives website: <http://sustainability.emory.edu/page/1008/sustainable-food>).



The topics included are:

1. Defining sustainability and sustainable food
2. Food and place
3. Identifying sustainable food: an introduction to marketing terms
4. Health benefits of eating sustainably

5. Nutrient content and sustainable food
6. Pesticides and organic food
7. Genetically modified organisms (GMOs)
8. Food choices and environmental impact
9. Energy and food production
10. Animal welfare and humane treatment
11. Grass-fed livestock
12. Sustainable seafood
13. The case for local food
14. Economic benefits and job creation

c. Farmers Market and Special Events

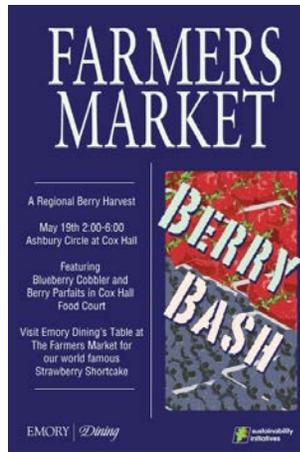
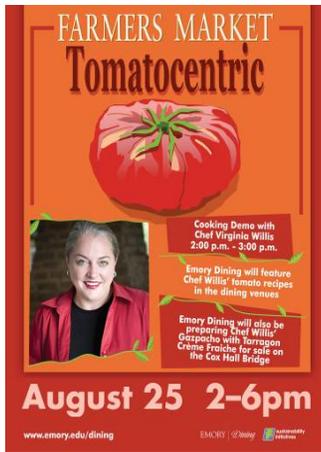
Our goal for this year of support from the Georgia Department of Agriculture was to expand the number of shoppers and volume of purchases at the Farmers Market each month by 15% over the course of the year and to expand the awareness of Georgia specialty crops in season and how they can be used. The market manager stated that there were several hundred individuals added to the market regulars. The pictures below illustrate the welcoming presence of the market on campus.



The market's special events were promoted with strategies such as light pole banners, electronic flyers, paper flyers, posters, electronic signs, websites, and listservs. The regular market was also supported by advertising in the student newspaper and the neighborhood newsletter.

The special market events spotlighted Georgia crops in season. Events held in 2009-2010 were:

- Vidalia Onion Ring Fry
- Tomato Centric, featuring Georgia heirloom tomatoes
- Pumpkin Fest
- Berry Bash, featuring blueberries and strawberries, sold by the flat, as well as plants and bushes
- Grow Your Own event featuring workshops on organic gardening and bee keeping
- Earth Week Market Party featuring "Southern Farmers Market Cookbook" author, Holly Herrick, with chef demo featuring turnip and spring onion soup.
- Summer Ice Cream Social featuring Georgia peaches in the ice cream and peach compote on top
- Favorite Flavors of Summer market party, featuring local, Georgia sweet corn and watermelon.



d. Sustainable Food Fair:

The first goal was to promote awareness of the sustainable, local food movement in Georgia, including specialty crops along with the full range of foods desirable for a healthy diet. This year, chefs featured Georgia butternut squash, cabbage, carrots, onions, tomatoes, fruit, grits, Georgia shrimp and local grassfed beef. Organic pretzels, sweet rolls, salsas, breads, and jams were also sold or given as samples. Farmers sold a full array of fresh vegetables, eggs, and other items.



Students from Anthropology 250 dressed as a tomato, carrot, and strawberry to highlight issues around those Georgia crops. Others staffed educational tables; displays, posters, and surveys also explained key concepts of local and sustainable food. Students' assessment of the fair is appended to this report and provides feedback from both participants and vendors.

Vendors stated that they made more money at the food fair than they did on a normal farmers market day. The free samples were well liked by participants, but the number of participants sampling was impossible to keep track of because of the crowds. Out of 100 surveys completed, ¾ said they were very well educated about sustainability. The walking veggies were the most interesting aspect of the education process.

Additional Components of our Project: Labeling and Student Awareness

We were particularly encouraged by the Georgia Commissioner of Agriculture to report results of our efforts this year to label local foods in Emory's dining services. In our two main central campus locations (Cox Hall food court and resident dining at the Dobbs University Center), transparent plastic films were made with insignia for "Georgia grown" and "regionally grown" produce, and placed on the glass sneeze guards to signal fresh, local produce when available. Although some Georgia produce was offered without a sign, in general the signs were easy for staff to remember, easily understood by buyers, and seemed to generate more interest in choosing produce. Staff estimate that over 3,000 people have seen these signs on a typical day—an important way to build both the market for Georgia horticultural crops and awareness of which crops are in season. This work was funded by Emory Dining as a donation to the effort.

Finally, Emory students created a new magazine in this academic year—called *Generation Response*. It provides an outlet for concerned students on a range of urgent societal issues. It was a great pleasure to discover that the first issue highlighted Emory's Educational Garden Project and its Farmers Market, an example of how these important efforts make an impact on students. A copy of the article was provided to the Georgia Department of Agriculture in July, 2010.

4. Beneficiaries

a. **The Garden Project** Coordinator reports that we had 25 regular gardeners at the 3 main Emory sites and another dozen at the Oxford garden. Two key gardeners maintain the Yerkes site and another main gardener keeps the Center for Science Education site. In total, then, we reached about 40 gardeners with horticultural education, lower than the 50 we had hoped to reach. The fact that a new garden was established, however, shows interest has not waned.

We met our goal of 5000 viewers of the gardens. We estimate conservatively that 3000 spectators learned by passing the gardens during the growing season. In addition, the Sustainable Food Fair alone

brought out 2000 people, who passed the Cox Garden as well as the table near it, staffed by Garden Team members.

b. Outreach Lesson Plans and Educational Materials

We hoped these information sheets would benefit from 125 hits to the Emory Sustainability website each day. However, current hits to the Emory sustainability website now average over 500 per day, which greatly exceeds our goal. Unfortunately, we cannot track hits to individual spots on the website. The sheets have already been read by the state-wide leaders of the new Georgia Food Policy council and their July, 2010, minutes read: “The Sustainable Agriculture Workgroup found the *Eating sustainably: an introduction to sustainable food* document provided by Peggy Barlett, PhD from Emory University, was very useful in defining what the workgroup would like to support and advocate for and will be used to define the purpose of the workgroup.” This is exactly the kind of outreach we hoped to have.

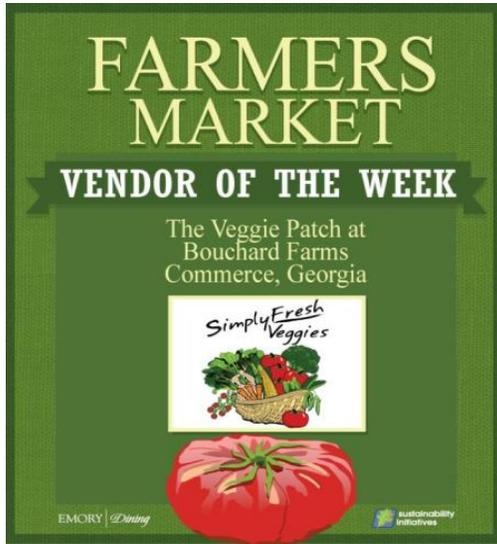
c. Farmers Market and Special Events

The farmers market events pioneered this year were a huge success. They attracted larger crowds than on regular market day, and many passersby purchased items at the market and enjoyed free samples of special products under promotion. The events were estimated by the market manager to add several hundred individuals to market regulars.

It is difficult to determine whether or not we have increased sales by 15% over the past year, because there has been considerable flux in the specific vendors at the market and also a major change in market calendar. The market has between 75-150 regular customers on any given Tuesday, and another 400 occasional buyers. We were going to track sales monthly; however, because of the variety of vendors, customers, and products, it became too difficult. Because sales were very low in summer 2009 when students and faculty were gone from campus, the vendors requested suspending the market during June and July, 2010, and instead requested that we keep the market open during the winter. We revisited the market schedule based on their recommendations and changed the calendar to be more in line with the school schedule. The vendors have been pleased with our flexibility and with the new schedule. To keep momentum for the market going with remaining staff over summer, we held the monthly special events. But with the addition of winter months and the subtraction of summer months, it makes calculation of an annual increase in sales difficult.

In addition, the Georgia floods of September, 2009, and the unusually cool spring of 2010 also reduced the amount and variety of produce available in the Fall, and though Spring sales were higher than winter sales, the weather does play a role in market sales. When it is raining, snowing or extra cold, market vendors do not always make the drive into the city because they fear it will not be worth their while to come. In fact, when weather is bad, customer visits are low. Emory Farmers Market is unusual in that it is less of a destination market than other markets in Atlanta; the customers consist mainly of Emory students and employees, rather than members of the broader community. We would like to have 4-5 more produce vendors and then we will attract the level of shoppers that would be ideal.

Meanwhile, despite the difficult weather and the change in schedule, we are very pleased with the loyal group of vendors and buyers that the market now has. The summer events kept up the momentum, and we feel the Georgia Department of Agriculture support for the special market events are key to building awareness of local food and financial success for vendors. We expect to have stronger measures of growth next year. The pictures below show that delicious Georgia horticultural crops were a delight to farmers market shoppers.



d. Sustainable Food Fair:

Beneficiaries of the Sustainable Food Fair met our goal for 2009. Emory Dining staff and vendors estimated 2,000 people attended (though students estimated 1,500). Vendors report that they made considerably more money at this fair than on a normal Tuesday farmers market, which indicates the high level of interest it generates. One student reported watching a dorm-mate learn about local food from one farmer and then proceed to the next booth and ask thoughtful questions of that vendor as well, an example of growing awareness of non-traditional crops and their growing methods. The joyful atmosphere of the Fair reflects the enthusiasm of Georgia's growing local food movement, and the passion of the vendors who explain how their sustainably-grown produce is different from conventional food builds enthusiasm among employees and students who were not otherwise aware, thus meeting our goal of market momentum.

5. Lessons Learned

a. Educational Garden Project: Regular inspection of gardens is important to see when teams may be falling behind on regular weeding and when new materials need to be ordered; Judith Robertson

instituted a new procedure for emailing each team and following their progress. Regular dinner and potluck planning meetings are also important to keep teams healthy. We learned that teams composed of staff members were more likely to maintain attractive gardens in the summer months, when students are gone.

b. Outreach lesson plans and educational materials: We learned that good text on these issues is hard to write and but that the desire for this information spans student and professional groups. We hope to expand the Info Sheets with several future topics.

c. Campus farmers market and special events: We learned that banners and flyers, as well as emails, are the most effective ways to generate support for the market's special events. We learned that special events are an excellent way to raise enthusiasm for particular seasonal Georgia crops. We learned that it is not possible to track sales by month in a useful way, when vendors and buyers fluctuate so much. We also learned (see above) that a good calendar for the market is essential, and will implement changes for next year to improve sales and vendor consistency.

It proved to be too difficult for the market manager to survey vendors and count the number of attendees in order to determine whether there was an increase in participation. The manager did estimate that there were several hundred individuals added to the market regulars. We now realize that a farmers market is always in motion, and accuracy in numbers is hard to attain.

d. Sustainable Food Fair: We learned that holding the Fair a little later in the Fall allowed students more time to plan and prepare, resulting in a more complex and useful series of educational activities. We also learned that costume-wearing students are among the most effective ambassadors for new information to fair participants.

Obtaining information from vendors regarding their sales volume was difficult. Nineteen out of 19 written vendor evaluations were completed (about half of the vendors), but comments were regarding the fair itself—set-up and arrival time, etc. Vendors verbally stated that they made more money at the food fair than they did on a normal farmers market day; however, there were no specific dollar amounts mentioned.

The survey and the verbal questioning conducted with the attendees were not as successful as we would like. Some of the attendees were not cooperative when they were asked questions regarding what knowledge they have learned about sustainability and specialty crops by attending the fair. The written survey needs to be more specific regarding key messages displayed at the fair.

Conclusion: overall, these four components of our grant were very successful. We see clear evidence of expanding and deepening awareness of Georgia horticultural crops, the need to eat seasonally, excitement about specific seasonal foods, knowledge of how to grow them, and a desire to buy them year round. Definitely “momentum for market expansion!”

6. Tracking of Grant Funds and Use for Specialty Crops

For all parts of the grant, careful records of each expenditure are kept by the Office of Sustainability Initiatives (and other offices, where appropriate). Records of matching or in-kind expenses are kept for purchases and direct expenses (such as copying) related to the project. These four components of our project involve many different units of the university, donations of time and materials, and considerable coordination. The salaries of Professor Peggy Barlett and Ms. Julie Shaffer, market manager, are paid for by Emory and are a contribution to this effort. In addition, depending on the university unit responsible, some parts of the expenses for each component are not charged to the grant, but are paid for by Emory. We have not attempted to keep track of every bale of mulch donated by Facilities Management to the gardens or every condiment purchased for a food event at the Farmers Market, nor the personnel expenses (such as Emory Dining chefs at the Farmers Market events) donated during those activities. Nor has the considerable work of faculty and student experts in writing the Info Sheets or the students who put on the Fair been included in our in-kind calculations. For this reason, we do not have a total for all of Emory's in-kind donations. Funds have been used as follows:

- a. Educational Garden Project: The grant funds for this component of the project were used for seeds, planting materials, supplies, mulch, small laminated signs that identified plants in each garden, planning dinner for combined teams, and Judith Robertson's part-time salary.
- b. Outreach lesson plans and educational materials: The grant funds for this component of the project were used for copying the booklets. Emory funds supported the dinner meetings of the committee that created the booklets. There are a few elements of the Information Sheets that fall outside of the covered horticultural crops, such as the picture of the student bread-maker on the cover (one of four) and the info sheets on grassfed meats and sustainable seafood, but the proportion of total expenses that they represent is substantially less than the Emory donations to the effort. The overall impact of the booklets is to build market momentum for Georgia non-traditional crops.
- c. Campus farmers market and special events: The grant funds for this component of the project were used for development of publicity materials. All costs of produce from local farmers for the free tastes or low-price samples presented by Emory chefs were paid for by Emory Dining. Though the market includes a baker and several vendors selling products that are not based on crops covered by the USDA grant (such as guacamole sold by our salsa maker), the funds provided from the Georgia Department of Agriculture were used to support only the publicity materials for events associated with horticultural crops. Other expenses related to the market—such as the manager's salary—are covered by Emory.
- d. Sustainable Food Fair: The grant funds for this component of the project were used for signs, posters, postage, copying, t-shirts for volunteers, and supplies for the event. The expenses for the Fair charged to the grant were used to promote market expansion on specialty crops. The Fair does include some booths that have non-specialty crops (such as eggs and bread), but no charges to this grant supported those individual booths. Overall, we estimate those fair activities to be less than 10% of the total, and the Emory in-kind donations of salary and materials greatly exceed this portion of the Fair related to these products.



Specialty crop grant funds were used only for specialty crop product promotion. Non-specialty crop product promotion (grits, shrimp, grassfed beef, organic pretzels, sweet rolls, salsas, breads, and eggs), were paid for with matching funds from Emory University.

7. Contact Person

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8. Additional Information

Appendix 1: Emory University Educational Garden Events – 2009-2010 4 May 2010

- 05 aug 2009 Urban Land Institute (ULI) conference video includes footage of Cox Garden
- 23 aug 2009 Potluck Picnic at the Depot for gardeners n=7
- 24 aug 2009 Green Fair – Evans & Few – recruiting table n=200 (20 workers signed up)
- 16 sep 2009 Fall Garden Kickoff Dinner n=22
- 17 sep 2009 Alice Waters visit/tour n=20 est.

25 sep 2009 Sustainable Food Fair – recruiting table n=2000 (17 workers signed up)

21 oct 2009 Rollins Environmental Health Action Com /work group. – (12 workers signed up)

13 jan 2010 Spring Garden Kickoff Dinner for gardeners n=17

04 mar 2010 Dirt – the movie – recruiting table n=80 est. attending (3 workers signed up)

20 apr 2010 Graduate Student Family Event n=100 est. (0 garden tours due to rain)

22 apr 2010 Earth Day Celebration – recruiting table n=200 est. (7 workers signed up)

14 may 2010 Staff Fest – information table

Appendix 2: Food Fair 2009 Student Assessment Report

September 26, 2009

Evaluation Team: Liz Rogawski and Naomi Schuster

Unanimously, the food fair was a success according to 19 out of 19 returned vendor evaluations! We received feedback from only about half of the vendors, but their comments were consistent and seem to us to accurately represent the outcome of the fair. For all questions on the feedback form, the majority of vendors agreed that each aspect of the fair was strong. Arrival and set-up and the educational value of issues raised at the fair were ranked lowest, receiving several low scores of two and three (out of 5 possible points) on the feedback form. Arrival and set-up issues may have been caused by poor traffic flow and parking confusion. Also, several vendors arrived before the tables were set up and were not sure where they should unload. We do not consider the educational value as judged by the vendors as significant as education feedback from attendees because the vendors were mostly confined to their individual tables. They did not have as many opportunities to walk around and learn about the educational issues we displayed with signage and with the walking veggies. The feedback indicates the clean-up at the conclusion of the fair went more smoothly than the arrival and set-up, but we did not receive as many responses for this question. Several vendors left early without help from our class. Contact prior to the fair was rated highly, and the overall organization of the fair and interactions with participants were also rated well.

Several common concerns from the vendors were difficulty in parking, insufficient number and placement of recycling and garbage containers, and too few hydration stations. In the planning of future fairs, we suggest having hydration stations at both ends of the Cox Hall Bridge. There were many compost bins, but without a place to put normal trash, attendees misused these bins. We suggest a mix of trash cans and recycling bins in the future. Despite the new map and directions, parking continued to be a problem because cars were allowed to drive onto Cox Bridge, which caused congestion and confusion in returning to the Peavine parking lot. In the future, we suggest keeping the traffic flow around Asbury Circle only and carrying by hand a larger portion of vendor equipment.

There were also several concerns from the vendors pertaining to the sustainability of the fair. Specifically, they argued that Mayfield Dairy was not a truly sustainable purveyor; another concern was

that balloons were not environmentally friendly. We thought Mayfield was an enthusiastic participant, but we recognize that they are not completely sustainable in using high-fructose corn syrup, for example. While we recognize that the balloons are not entirely sustainable either, they did call positive attention to the fair, and we made sure to dispose of them properly after the fair. Other suggestions included adding more activist and lobbying groups, providing larger areas of shade, and having the fair twice a year.

The feedback dot-technique was a success in evaluating participant feedback. We estimate that about 1,500 people attended the fair, with three or four-hundred at the fair at one time. Over one-hundred participants responded to our questions, which is less than ten percent of total attendees. However, comments were consistent. Approximately three-quarters of participants felt they were educated very well about specialty crops and sustainability, and were made more aware of sustainable alternatives. However, publicity was rated weaker with twenty-five percent of the respondents rating publicity “not at all” or “somewhat well.” This may have been a result of late flyer dissemination and lack of chalking. However, we agree that the new yard signs were most likely effective and hope to use them again in the future. By the nature of the fair being in such a central location, it makes sense that many of the participants stumbled upon it without having previously heard or read about it. Simply having the fair in this location with attractive music may be the best publicity of all. The organization of the fair was rated the highest and over one hundred participants rated that the organization was carried out “very well.”

The flip charts for participant feedback were not as popular. When asked how they were behaving sustainably in their personal lives, some participants did not take the question seriously or chose not to answer at all. However, we did receive several relevant suggestions for future fairs. Multiple participants suggested having the fair two times a year or even more often. The free samples were tasty and popular, but participants were also interested in more buying options. Attendees were also satisfied that the fair was on Friday since this day of the week is generally less busy, and they had more time to enjoy it. The ice cream and grits received the highest ratings in terms of favorite food samples at the fair.

Our three main goals for the food fair were to inform and educate the Emory community, to publicize the fair well, and to run a well-organized fair. The educational component was successful for the participants, although we did not satisfy all of the vendors. In the future, it would be helpful to ask the vendors if they have in mind any specific educational components related to their products that they would like us to include. Similar to previous years, publicity was not ideal, but our few new ideas for this year were effective. Flyers would have been more effective if they had been distributed earlier and sent to a broader user base on Learnlink. However, despite the confusion in the morning, the overall flow and organization of the fair was successful. We anticipated many of the issues in the planning stages of the fair and warded off any major disasters. Not only did we achieve most of our goals, but the weather held out, and the fair was fun for everyone!

18. DEVELOP EFFICIENT DRYING TECHNOLOGIES AND INNOVATED VALUE-ADDED DRIED NATURAL PRODUCTS FROM RABBITEYE BLUEBERRIES – UNIVERSITY OF GEORGIA – FINAL PERFORMANCE REPORT

Project Summary:

Individually Quick Frozen (IQF) rabbiteye blueberries (*Vaccinium ashei*.) were dried in an air-impingement oven using two different configurations (A and B) to a water activity of 0.55 ± 0.05 . Conventional forced air oven (C1) and a jet-zone fluidized bed dryer (C2) were used as control methods. The effect of pretreatment, cultivar (Brightwell and Powderblue), pick time (1 and 2), grade (A and C), drying temperature (85 and 107°C) and drying method on drying time and physico-chemical properties of dried blueberries was investigated. Moderate thawing (~20 min) at room temperature followed by surface scarification increased drying rate. Drying times were lowest for C2 followed by B, A and C1 at both temperatures. Drying method, temperature, cultivar and interactions among them showed significant effect ($P \leq 0.05$) on drying time. Different variables and their interactions showed significant effect on composition, texture, bulk density and color of dried blueberries. Impingement oven showed promise to dry rabbiteye blueberries.

Project approach:

The main objective of this project was to evaluate effectiveness of different drying technologies on Rabbiteye blueberries and to determine the quality, safety, and consumer acceptance of dried blueberries.

Preliminary drying studies were conducted with individually quick frozen (IQF) Rabbiteye blueberries obtained from Alma/Bacon County Development Authority, Alma, GA. Frozen blueberries were thawed for 30-60 min and the surface of the berries was scarified using an in-house fabricated manual scarifier to facilitate drying. Drying experiments were conducted at 85 and 107°C using an impingement drier and a conventional forced air oven. Moisture desorption isotherms and drying curves were determined. We noticed a need for effective pretreatment (scarification) to reduce drying time and to achieve uniform drying.

A mechanical scarifier with a series of spiked rollers, a conveyor belt, adjustable clearance and speed was developed. For effective scarification of frozen blueberries, appropriate thawing time was determined as 20 min with trial runs at different thawing times. Drying experiments were conducted at 85 and 107°C using both forced air oven and the impingement drier. Temperatures at different locations in the drier were monitored and recorded using temperature data logger throughout the drying experiments. Moisture desorption isotherms and rate of drying were determined. Results showed improvement in drying with scarification.

Two grades of Rabbiteye blueberries, grade-A and grade-C of Brightwell and Powderblue cultivars from the first and second harvest, Pick-1 and Pick-2, respectively, were used for drying experiments to determine the effect of grade, cultivar, and harvesting time on quality along with drying method and temperature. Drying experiments were conducted using forced air oven, impingement drier (with both top and bottom air flow) and impingement drier (with top air flow only) at UGA Griffin Campus and a commercial scale Jet-zone fluidized bed dryer at Alma, GA to a target water activity of 0.55 ± 0.05 . Experiments were conducted in duplicate with 1-Kg

samples using a factorial design based on Cultivar*Pick*Grade*Temperature combination. A total of 96 batches of blueberries were dried and packed in high barrier polyethylene bags for quality analysis.

Physical properties like bulk density, color and texture were determined for all the samples using glass-beads method, a Hunter lab colorimeter and an Instron Universal Testing Machine, respectively. Assuming method of drying does not affect the chemical composition; only sample dried using the commercial scale Jet-zone fluidized bed dryer from Alma were used for analysis of moisture, fat, protein and ash content using standard AOAC and AOCS procedures.

A consumer test with 50 adult panelists was conducted on 6 dried blueberry samples. Mean consumer acceptance ratings were determined for each sample using a hedonic scale; 1=dislike extremely; 9=like extremely for overall acceptance, appearance, color, flavor, aroma, and mouthfeel.

Polyphenolics were extracted from dried blueberry samples using 80% (v/v) acetone water. The resultant extract was passed through an Amberlite column to remove simple sugars and organic acids so that a powdered dry extract could be obtained. Total Phenolics were determined by the Folin-Ciocalteaux method and total antioxidant capacity by the Oxygen Radical Absorbance Capacity method.

Goals and outcomes achieved:

Pretreatment step is an important factor to speed up the drying process. Partial thawing (20 min) followed by surface scarification using a mechanical scarifier increased the drying rate. Drying is faster at 107°C compared to 85°C to achieve a shelf-stable final water activity of < 0.60. Effect of blueberry cultivar and grade was not significant on drying curve with a forced-air oven method. The desorption behavior of IQF Rabbiteye blueberries was successfully described using an empirical equation as $Y=Ae^{BX}$ ($A=1.1078$ and $B=4.7144$) where Y is the dry basis moisture content and X is the water activity. The effect of blueberry cultivar, grade and drying temperature (85°C vs 107°C) does not have significant effect on the desorption isotherm. Several well-known predictive isotherm equations were tested and only modified Halsey model closely fitted the experimental data to predict the desorption behavior of Rabbiteye blueberries.

Impingement oven method of drying proven to be a viable option to produce dried blueberries following a mechanical pretreatment. Impingement drying reduced the drying time when compared to forced air oven and is more efficient even at lower air velocities when compared to jet-zone fluidized bed dryer. Modified impingement oven with an air flow only from the top significantly reduced the drying time at 85°C when compared to impingement oven. However, the overall drying time is lowest for jet-zone fluidized bed dryer followed by modified impingement oven, impingement oven and forced air oven at both temperatures (85 or 107°C). Drying times were approximately 50% lower at 107°C than at 85°C for all drying methods. The main difference in drying time among these methods is attributed to the difference in the configuration and air velocities of individual drier. Blueberry cultivar and drying method with an interaction with drying temperature showed significant effect on drying time. The mean drying times of Brightwell blueberry (4.08 hr) was higher than Powderblue blueberry (3.95 hr). The main reason for the difference is attributed to the difference in basic cellular structure, size of blueberries on the whole and difference in the total soluble solids content. However, the difference due to cultivar is noticeable only when the batch size is bigger (≥ 1 kg).

Assuming method of drying will not show any effect on composition; the dried blueberries from jet-zone fluidized bed dryer were used for proximate analysis. Cultivar, pick time, grade, drying temperature and several interactions among these variables showed significant effect on the composition of dried

blueberries. However, the fat, protein and ash contents are all very low in blueberries; it has no practical meaning for the difference due to variation among cultivars, pick times and grades. Similarly, different tested variables and their specific interactions showed significant effect on bulk density, color and texture of the dried blueberries. Mainly, the variation in physical properties correlated with differences among the drying methods and biological characteristics of the blueberries. Overall, modified impingement oven drying resulted in lowest bulk density (0.767 g/ml) dried blueberries. Only, the interaction between cultivar and pick time showed significant effect on the texture of the dried blueberries. Powderblue and pick-1 combination had the highest shear force value (24.03N) and Powderblue and pick-2 combination has lower shear force value (20.01N). The color values (Lightness, Chroma and Hue) are comparable with the other drying methods.

Results from drying experiments suggest impingement oven can be an alternative drying method to produce high quality dried products from rabbiteye blueberries. Future work should focus on the further improvements to the modified impingement oven to match up with the jet-zone fluidized bed drier drying times as well as analyzing nutritional, microbiological quality and consumer acceptability of the dried blueberries.

Appearance ratings ranged from 5.06 to 5.70. There were no significant differences found between sample ratings. Color ratings ranged from 5.44 to 6.10. There were no significant differences found between sample ratings. Aroma ratings ranged from 5.56 to 5.86. There were no significant differences found between sample ratings. Flavor ratings ranged from 5.14 to 5.76. There were no significant differences found between sample ratings. Sweetness ratings ranged from 5.44 to 6.10. Brightwell ratings were significantly higher than Powderblue ratings in blueberries dried at 107°C (Pick 1, impingement top). Texture ratings ranged from 4.16 to 5.08 and were significantly different. Brightwell berries dried at 107°C (Pick 2, impingement top) were rated significantly higher than Powderblue berries. In summary, Grade A Brightwell berries dried at 107°C had significantly higher ratings over Grade A Powderblue for sweetness and texture but not in the other attributes, including consumer acceptance.

Total polyphenolic extract ranged from 2.44% of Grade C Brightwell sample dried from the top in the impingement oven to 3.26% of Grade A Brightwell sample dried the same way. Total Phenolic Content (mg GAE/g sample) ranged from 11.02±0.162 for forced air oven dried Powder Blue to 18.94± 0.127 for Impingement. There was no obvious effect of cultivar, but the forced air oven produced the lowest yield compared to impingement ovens. Impingement drying from both sides produced higher yields of Total Phenolics than from the top alone. ORAC values closely paralleled Total Phenolics and ranged from 144.3±4.93 umol Trolox equivalent/g sample for forced air dried Powder Blue to 377±27.2 for Powder Blue dried by impingement oven from both sides. Currently, vitamin C content is being determined by the microfluorometric method (AOAC 967.22, 45.1.15) and anthocyanins by the pH/absorbance differential method. The commercial dryer in Alma produced almost as high yield of total phenolics and ORAC values as the laboratory impingement dryer. The microbial qualities of dried blueberries were determined. Ten g of each sample was placed into 90 mL of Day-Engley neutralizing broth and stomached at normal speed for 1 minute. A total of 1 mL of each sample was plated onto four plates of plate count agar (PCA) and 4 plates of potato dextrose agar (PDA) using the spread plate method. The PCA and PDA plates were incubated at 37 and 28°C, respectively for 24 and 72 h, respectively. The rinsing solutions were analyzed for total plate counts, total mold and yeast counts, and total coliform counts.

Beneficiaries and how they benefitted:

Blueberry farmers and processors. Research findings were presented in a professional society (Institute of Food Technologies) annual meeting in 2011. This was a poster presentation, with over 200 people

stopping to read our poster, and more than 40 people asking questions on our blueberry drying studies and our research findings. Information was also shared with UGA extension specialists, in order for them to share with blueberry farmers and blueberry associations.

Lessons learned:

It is possible using a low cost dryer to produce high quality and consumer acceptable natural dried Rabbiteye blueberries. How this technology or other similar drying technology can be adopted by blueberry farmers to add values to their crops is been conducted by a grant in 2010.

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Any additional information (publications; websites; photos: etc):

Yemmireddy, V.C.K., Y.-C. Hung, and M.S. Chinnan. 2011. Effect of impingement drying on physico-chemical properties of frozen Rabbiteye blueberries. IFT Ann Mtg. New Orleans, LA. June 11-14, 2011. Abstract No. 154-15.

Yemmireddy, V.C.K. 2011. Develop efficient drying technologies and innovated value added dried natural products from Rabbiteye blueberries. M.S. Thesis, University of Georgia, Athens, GA

19. GEORGIA GROWN PROMOTIONS – GEORGIA DEPARTMENT OF AGRICULTURE – FINAL PERFORMANCE REPORT

Project Summary

The Georgia Department of Agriculture undertook three projects to promote the Georgia Grown, specialty crop campaign: (1) creating a Georgia Grown website; (2) creating promotional materials; and (3) organizing/implementing the Third Annual Georgia Grown Food Show.

- (1) A website company was hired to create the Georgia Grown website. After the work was completed, the department's new Commissioner determined the website was too simple and not user-friendly. The decision was made not use the website, and have a much more in-depth and user-friendly website created in the future.
- (2) Promotional materials were developed to create consumer awareness of local Georgia Grown specialty crop products. Using the Georgia Grown logo will help consumers to associate safe and healthy products with Georgia Grown products. **Ninety-five to 100 percent of the promotional materials were regarding Georgia's specialty crops.****
- (3) Using funding from the 2008 and 2009 SCBGs, the Third Annual Georgia Grown Food Show was organized and presented at the Georgia Railroad Depot Banquet Facility. The show was held on October 12, 2009, from noon to 4:30 p.m. It brought together 54 local

farmers, producers and manufacturers, together with chefs and caterers throughout the state. There were 25 specialty crop booths (out of 54 total) at the show. **Approximately 50% of the participants were specialty crop growers and purchasers; therefore, Specialty Crop Block Grant funds were only used for that percentage of costs.** The other 50% represented non-specialty crop participants, and those costs were paid for by the Georgia Department of Agriculture.

The attendees included teachers, chefs, restaurant owners, food service industries, retailers, hospital cooks, school nutritionists (including state universities) and country clubs. We had a somewhat smaller group of attendees due to a heavy rain. There were approximately 150 attendees; we were expecting 200 or more.

The show also had a variety of activities including a chef competition with local specialty crop products, as well as break-out sessions on the Georgia Grown program, organics, farm to school opportunities for farmers; international trade opportunities, as well as others.

The last two projects above were very successful in raising awareness of Georgia Grown specialty crops, as well as their marketability, and consumption.

Project Approach

A website company was hired to create and implement a Georgia Grown website. Included within the website was to be information about the Georgia Grown program, Georgia Grown specialty crop products, advertisements of the growers who have the Georgia Grown seal/logo, the application for the grower to become part of the Georgia Grown program, a list of specialty crop growers and their information, agritourism information, list of commodities and information on each agritourism location, which farmers grow what commodity, and information about farmers markets.

Promotional materials boosted awareness of specialty crops with the Georgia Grown logo, such as the food show directory and attendee and exhibitor postcards. There was also a large display board created to advertise the food show. Also purchased were pop-up stands to be used at conferences and tradeshow showcasing specialty crops in Georgia.

The Third Annual Georgia Grown Food Show included growers, producers, and distributors of Georgia specialty crops and other products within the state and was a multi-promotion event. This year's approach included:

- Promotional materials to teachers, chefs, restaurant owners, food service industries, retailers, hospitals, school nutritionists, state universities and country clubs.
- Recruitment of Georgia companies by emails or telephone calls.
- Usage of the old Railroad Depot, which is owned by the state and is used for state events.
- Conducting a chef competition using in-season Georgia specialty crop produce.
- Offering break-out sessions.
- All specialty crop producers brought informational packets and samples to the show.

Goals and Outcomes Achieved

- Our initial goal of creating a Georgia Grown website was ultimately not fulfilled; the finished website was determined to be too simple and not user-friendly, so the department decided not to use it.
- The promotional materials created were greatly used at the Third Annual Georgia Grown Food Fair, as well as several conferences and trade shows.
- The Georgia Department of Agriculture invited 400 attendees to the Third Annual Georgia Grown Food Show; approximately 150 actually attended. We expected to have more than 60 specialty crop farmers' booths; there were 27 out of 55 total booths.
- Our goal was to increase retail sales of Georgia Grown specialty crop produce by 30 percent. The use of surveys to be sent to exhibitors six months after the show, would have been a good indicator of the increase in retail sales. However, with departmental budget cuts and the loss of several key employees, six-month surveys were not sent out.
- Based upon the initial surveys (exhibitor and attendee), there was at least a 50% increase in awareness of specialty crops by attendees because of the show; 90% of participants said they would attend next year's show; 100% of attendees plan on purchasing Georgia Grown specialty crop products based upon their experience of the show; and 66% plan on pursuing business relationships with exhibitors from the show.
- The exhibitors estimated, based upon their contacts made from the show, that sales over the next 12 months would be approximately \$6 million (this is a much higher figure than the \$3.9 million in 2008). Unfortunately, this amount cannot be confirmed, as there was no follow-up survey conducted 12 months following the show.
- Because of department budget cuts and loss of department employees, there was no end-of-year survey conducted for the chefs and distributors to determine what amount of Georgia Grown specialty crops they will likely purchase.
- Produce suppliers were likely to increase their retail sales by 30 percent due to the media advertising of the show (by attracting more attendees). However, since there was no follow-up survey, this cannot be accurately estimated.
- A large number of contacts were made, which should lead to an increase in sales of specialty crop produce to chefs and restaurant professionals.
- There was income from the food show of \$2,600. This amount was immediately put back into the program to further expand the specialty crop marketing in Georgia.

Beneficiaries

Since the website was never up and running, there were no beneficiaries from its use. Hopefully, in the future, a new and updated version will be created and put on line; this is still an important goal of the department.

All of the attendees of the conferences, tradeshow, and food show benefitted from the promotional materials distributed. These materials promoted Georgia's specialty crops by giving each attendee something to take back with them to study later, and remind them of the importance of healthy locally grown specialty crops. The materials also benefitted the grower/producer of specialty crops since they will encourage consumers to purchase Georgia specialty crops.

There were a large number of beneficiaries from the food show, as shown below. Growers/producers (farmers, producers, manufacturers) benefitted by being able to connect with end users, which expanded their sources/market of specialty crop purchasers. Some of the growers did not realize the wide range of purchaser possibilities.

End users of specialty crops (chefs, caterers, teachers, school nutritionists, school students, restaurant owners, food service industries, retailers and hospitals) also benefitted by letting them connect with growers and producers, and seeing what is available and how simple it is to purchase from them.

Overall, the food show "accelerated the buzz" of specialty crops, locally grown produce. This had an impact upon all of the beneficiaries—word of mouth is a very valuable marketing tool.

- Georgia farmers
- Georgia producers
- Georgia manufacturers
- Georgia chefs
- Georgia caterers
- Georgia teachers, school nutritionists and school students
- Georgia restaurant owners
- Georgia food service industries
- Georgia retailers
- Georgia hospitals
- State university nutritionists
- Georgia country clubs

Lessons Learned

We have realized that in order to create a professional looking, in-depth, user-friendly website, it takes a lot of time/planning, money, and expertise; you cannot take shortcuts.

The food show was very successful in accomplishing its purpose of bringing everyone together to meet personally the specialty crop producers and their customers who have asked for years, "Where do we get local specialty crop produce?"

The preparation for this show required three of the staff members of the Marketing and International Trade Division working three entire months, full time. It is too mammoth of an undertaking for a division that has other domestic and international trade shows to organize and attend. Because of that, and in addition to a reduction of the department's budget and personnel, the department decided to discontinue any further plans for another show.

Exhibitor comments taken from survey responses said they would like a higher number of attendees; not to hold the show on a holiday, three-day weekend; better lighting; internet access; and more electricity.

Attendee comments taken from survey responses, said they would like to have more booth exhibitors; involve more education; and hold the show at a larger facility.

Contact Person for the Project

The main contact for this project is no longer with the Georgia Department of Agriculture.

For information, contact:

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20. IMPLEMENTATION, EXPANSION AND PRODUCTION OF GEORGIA GROWN OLIVES – GEORGIA OLIVE ASSOCIATION – FINAL PERFORMANCE REPORT

PROJECT SUMMARY

The Georgia Olive Growers Association was formed for the purpose of promoting and encouraging the growing of olive trees and production of olive oil in Georgia. Since olive oil was commercially produced in Georgia in the 1800's along the coastal regions of Georgia, it was reasonable to believe the olive oil industry could be resurrected in Georgia thus providing a fall cash crop for farmers. The potential economic impact is great as approximately 98% of olive oil is imported.

The Georgia Olive Growers Association proposed a project that would allow for an initial exploration of the potential for a viable olive oil industry in Georgia. Due to the lack of knowledge concerning olive tree planting and cultural practices in Georgia, funding was needed to allow relevant information to be acquired and to form the initial basis for development of an industry that would have not only a significant impact on agriculture in Georgia, but a significant impact in the Southeast.

GOGA believes the grant funding was critical in creating the excitement about an olive oil industry that now exists not only in Georgia, but nationally and internationally.

PROJECT APPROACH

Although the California climate is different from that of Georgia and the Southeast, GOGA believed that a study of how the California olive oil industry developed would provide a good foundation for development of the industry in Georgia. California now has approximately 40,000 acres of super high density plantings but still only accounts for approximately 1% of U.S. consumption of oil. The super high density method of olive tree plantings is relatively new in the world having originated in Spain around 20 years ago and having been introduced in California approximately 10 years ago by Spanish investors.

The Spaniards hired Alan Greene of California to spearhead development of the industry in California. Mr. Greene is recognized as the person who developed the almond industry in California which is now the world's largest producer of almonds, most of which is exported. Paul Vossen, a specialty crop expert with the University of California extension service, is recognized as one of the most knowledgeable persons in California regarding olive tree cultural practices. John Post is a recognized farming expert on olive tree cultural practices.

GOGA believed that establishing a relationship with these experts would be extremely beneficial with regard to information which could be applied to Georgia. Contacts would be made with the experts, combined with visits to California for personal observations, to establish the potential for olive oil development in Georgia.

It was also determined that a presence at the Georgia Grown food show at the Freight Depot in Atlanta, as well as a presence at the Southeastern Fruit and Vegetable Conference in Savannah would, along with development of a website, allow for the sharing of information and education of the public.

Monitoring of the plantings in Georgia, and cultural practices, as of 2009, would also aid in development of the information.

GOALS AND OUTCOMES ACHIEVED

The association's initial goals with this project were not met as anticipated. Approximately 40 acres of plantings did not produce any fruit due to extreme heat, a hard winter, and less than optimal cultural practices. Other plantings were not of the age to have production. The extreme heat caused possible pollination problems and there were also problems with the blueberry harvesters that were used to mechanically harvest. Only about 50 gallons of oil was produced this year; however, the trees were only 30 months old.

Due to economic conditions and the fact that interested farmers wanted to see that oil could actually be produced, the acreage goal was also not met. There are about 200 acres planted; however, there have been commitments for additional plantings in 2012. The hard economic times have been a significant factor, which makes farmers reluctant to take additional risks. We are hopeful that 500 acres should be planted by 2015.

However, much knowledge has been gained about the potential for commercial olive oil production in Georgia. Approximately 70 more acres have been planted since the initial activities of the association, just based upon the information learned and shared by association members. Approximately 50 additional acres are anticipated in the spring of 2012. This number could be greater in view of the national and international media attention that resulted from the first commercial harvest in Georgia since the 1800's.

The experts mentioned above visited the orchards in Georgia and met with association members as a group and individually. The consensus was that Georgia can successfully grow olive trees and that Georgia should be able to produce olive oil. The question still remains as to how much olive oil can be produced and as to whether the production will be sufficient to make Georgia the primary producer of olive oil on the east coast.

The harvest that took place at the Shaw Farms near Lakeland, Georgia, in September 2011 was done in order to show that olive oil can be successfully produced in Georgia. Although 30 month old trees would not normally be harvested, the association and the Shaws believed the public awareness that would result was worth the effort. That belief turned out to be true beyond the association's imagination. That fact is verified by the over 200 news outlets that carried the story, nationally and internationally, by a front page article in the Washington Post food section, by a feature article in Atlanta Magazine, by a feature article in Gun and Garden Magazine, by a feature on the Georgia Farm Monitor and by the numerous TV stations that carried the story. Response has been overwhelming, as evidenced by the fact that the Southeastern Fruit and Vegetable Conference requested that the association conduct an educational session at the 2010 conference in Savannah.

The media coverage is expected to result in more plantings in 2012, not only in Georgia, but in Florida and possibly South Carolina as well. As a result of the initial funding provided, GOGA is taking the lead in education of farmers, as well as the public in general, about olive tree cultural practices and olive oil production.

To gain initial knowledge about cultural practices, the association first contacted one of the leading olive tree growers in the U.S., John Post. Mr. Post met with the association members in South Georgia and observed the terrain, land, and growing conditions.

Contact was made with both Alan Greene and Paul Vossen to obtain their opinions and suggestions, based upon their experience in California, about the pros and cons of olive oil production in Georgia. This initial contact was at the personal expense of association members.

The association obtained a booth at the Georgia Grown food show held at the Atlanta Freight Depot in Atlanta, to gain information as to potential markets for olives produced in Georgia. Information was disseminated and a slide show ran continuously about olives. Photographs of the olive orchards in Georgia were displayed.

The association obtained a booth at the Southeastern Fruit and Vegetable show in Savannah in 2011 for the purpose of sharing information learned so far with farmers. The booth was manned for two days. A slide show ran continuously. Olive trees were displayed.

A web site was established to share information about the potential of olive oil production in Georgia. Georgiaolivegrowers.com

An information gathering trip was made to California to observe harvesting methods, cultural practices, and milling and blending practices. A seminar, conducted by certified olive oil tasters was attended in order to learn about the different tastes of various varieties of olives with respect to marketing and cultural practices.

A trip was made to California to meet with Nancy Ash, an olive consultant who is working with USDA on U.S. olive oil standards. An olive oil tasting was conducted by Nancy Ash at the Southeastern Fruit and Vegetable Conference in Savannah.

A seminar was held in Lakeland, Georgia with a presentation by the University of California specialty crop advisor and world recognized expert on olive production, Paul Vossen. Mr. Vossen made a presentation and then a field visit was made. Information was shared by farmers who had olive trees planted. A question and answer period was held. As a result of some discussions, UGA established a test plot under the supervision of Dr. Gerard Krewer, a well known UGA horticulturist, on the property of one member of the association.

A two day information sharing event was held with the assistant food editor from the Washington Post with various UGA officials in attendance as well as representatives from the Governor's office. As a result, an article appeared on the front page of the food section of the Washington Post. This generated a lot of interest and telephone calls are fielded nearly every day by some member of the association.

A spring seminar was held in Lakeland, Georgia in 2011 with approximately 200 in attendance, followed by lunch and a tour of the Shaw orchards. This seminar was more of an advanced seminar compared to the previous one held. Farm Manager for the California Olive Ranch, Adam Englehardt, spoke at the seminar on all aspects of olive tree planting, maintenance, and harvesting. In addition, Alan Greene, recognized as the person who placed California on a road that made it the world's leading producer of almonds and the person who kick started super high density plantings in California, made a presentation at the seminar on the financial aspects of olive oil production, and U.S., as well as global, olive oil marketing. Mr. Greene opined that there is good potential for Georgia to become a leading producer of olive oil on the east coast. After lunch, attendees drove out to the Shaw orchards. Adam Englehardt spoke about the different techniques of olive growing and demonstrated different methods of pruning olive trees.

GOGA will again have a presence at the Southeastern Fruit and Vegetable Conference to be held in Savannah on January 6, 2012. The GOGA presenter will be Paul Miller, President of the Australian Olive Growers Association. GOGA will again man a booth and share information about olive oil production.

BENEFICIARIES AND HOW THEY BENEFITTED

The many farmers who are seeking a fall cash crop that nets more than cotton, peanuts and corn benefitted from this project as well as the public, which has been educated about the difference in quality of olive oil produced in the U.S. as compared to the imports from Europe. The specific number of farmers, as well as the public, is difficult to approximate. Many emails and telephone calls of support have been received. In the final analysis, the consumer will be the one who has benefitted most. As a result of this project, the U.S. consumer will have the choice to purchase locally grown olive oil which was produced in a sustainable way and with the lowest carbon footprint of any olive oil sold on the east coast.

Farmers have been educated on the financial aspects of olive oil production, as well as the risks involved, and the profit potential. They have been instructed on cultural practices that association members have utilized in Georgia, about disease and pests that might present a problem and about practices that can be utilized to deal with any pest and disease problems. They have been educated on marketing olive oil, as well as what is involved in producing high quality olive oil.

LESSONS LEARNED

The primary lesson learned was that, even with the information garnered from California and experts, the climate in Georgia presents challenges that can only be met with actual hands on farming and sharing of information. Those challenges are being met by association members.

Another lesson learned was that with proper planning and strategic use of media and conferences, information can be effectively shared with farmers and the public.

Another lesson learned was that farmers form a unique brotherhood. The farmers in California have been very gracious to the association members and have freely shared what they have learned with regard to olive oil production and fully support our efforts in Georgia.

CONTACT PERSON

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ADDITIONAL INFORMATION

Photographs and videos are located on the association website, www.georgiaolivegrowers.com.

A Google search on Georgia Olives will show numerous hits concerning development of the Georgia olive oil industry.

Youtube has the Georgia Farm Monitor video. Numerous TV stations also have clips that have aired on their news programs, including WALB in Albany, Georgia.

21. PRODUCTION POTENTIAL AND NUTRACEUTICAL CONTENT OF GEORGIA POMEGRANATES – UNIVERSITY OF GEORGIA – FINAL PERFORMANCE REPORT

Project Summary

Pomegranate juice is well recognized for its phytonutrient content. The objective of this study was to evaluate and quantify the effect of blender and mechanical press extraction methods on juice yield and antioxidant properties of fourteen pomegranate cultivars grown in Georgia. Folin-Ciocalteu method was used to determine the total polyphenols. Antioxidant capacity was studied using ferric reducing antioxidant power (FRAP), Trolox equivalent antioxidant capacity (TEAC), and oxygen radical absorbance capacity (ORAC) assays. The juice yield averaged 30.61% of fresh weight (FW) of the fruit for blender and 24.56% for mechanical press. Total polyphenols and total monomeric anthocyanins were higher in blender (57.41 mg gallic acid equivalents (GAE)/100 g FW; 12.01 mg cyanidin 3-glucoside equivalents/100 g FW) compared to mechanical press (45.00 mg GAE/100 g FW; 9.53 mg cyanidin 3-glucoside equivalents/100 g FW), respectively. The organic acids, sugars and phenolic compounds were quantified using HPLC. Significant differences in the chemical properties of the aril juice were found after extraction by the two methods.

Project Approach

Fruits from each cultivar were divided into equal portions for juice extraction with either an Oster® blender (Oster, Fort Lauderdale, FL) or hand operated juice extractor/mechanical press (Strite-Anderson Mfg. Co., Minneapolis, MN). The juice was obtained by pressurization of the arils. In the blender, the white membrane and the arils were juiced while in the juice extractor, it was only the aril juice.

Dry weight was determined by standard AOAC method (1990). Total polyphenols were determined according to the Folin-Ciocalteu reagent method (Singleton & Rossi, 1965). The total anthocyanin content was estimated by the pH-differential (AOAC method 2005.02) method. Antioxidant capacity was evaluated by three methods, FRAP, TEAC, and ORAC. The FRAP assay was performed according to the method of Benzie & Strain (1996) with minor modifications. The TEAC assay was performed based on the method of Lee et al. (2003) with slight modifications. ORAC assay was carried out based on the method of Prior et al. (2003). The major organic acids (Chen et al., 2006) and phenolic compounds (Pastrana-Bonilla et al., 2003) were determined by HPLC with UV-vis detector based on authentic external standards. Major sugars were quantified by HPLC with evaporative light scattering detector (ELSD) based on external standards (Martens & Frankenberger, 1991). All samples were analyzed in triplicate, and the results are expressed as average \pm standard deviation. All statistical analysis were

conducted using one-way ANOVA and Duncan's multiple-range test was used to determine statistically significant differences of variables at $p \leq 0.05$ (SAS 8.2, SAS Inst., Inc., 1999).

Goals

Specific goals included:

- 1) Determine better method of juice extraction among blender and mechanical press
- 2) Determine juice yield for each cultivar
- 3) Nutraceutical content of aril juice of different cultivars
- 4) Postharvest quality determination
- 5) Identification of pathogens present on harvested fruit
- 6) Recommendation to the GPA as to which cultivar(s) should be considered for planting in Georgia

Outcomes Achieved

Cultivar Cranberry had significantly ($p \leq 0.05$) higher yields by both blender (41.26%) and mechanical press (36.31%) methods. Across all cultivars and extraction techniques, juice yield varied from 17.1 - 41.26% based on whole fruit fresh weight. However, in all the cultivars, the blender gave a better yield compared to the mechanical press. The highest significant ($p \leq 0.05$) dry matter content was found in cultivar White Don Wade (12.47% of FW) by blender. The amount of total polyphenols (TPP) varied between 28.88 - 85.84 mg GAE/100 g FW). Among the cultivars, Cranberry had the highest significant ($p \leq 0.05$) concentration of TPP (85.84 mg GAE/100 g FW) in the fruit juice obtained using blender and cultivar Afganski (67.42 mg GAE/100 g FW) in the fruit juice obtained using mechanical press. Our results showed that the antioxidant capacity among cultivars averaged 21.37, 9.07 and 611.97 $\mu\text{M TE/g}$ of FW by the FRAP, TEAC and ORAC methods, respectively, for blender; 15.68, 7.64 and 593.78 $\mu\text{M TE/g FW}$, respectively, for mechanical press. For blender, the highest significant ($p \leq 0.05$) FRAP value was found in Cranberry (38.57 $\mu\text{M TE/g FW}$), Afganski (38.54 $\mu\text{M TE/g FW}$) and Nikitski ranni (35.39 $\mu\text{M TE/g FW}$), highest TEAC value was Mejhos (11.03 $\mu\text{M TE/g FW}$) and highest ORAC value was Eve (693.95 $\mu\text{M TE/g FW}$). Cultivar Afganski had the highest significant ($p \leq 0.05$) FRAP value (24.42 $\mu\text{M TE/g FW}$), Cranberry had the highest TEAC value (10.59 $\mu\text{M TE/g FW}$) and Kaj-acik-anor had the highest ORAC value (652.36 $\mu\text{M TE/g FW}$) for mechanical press. Cultivar Kaj-acik-anor with dark red aril color had the highest significant ($p \leq 0.05$) total anthocyanin content in the juice extracted with both blender (36.56 mg/100 g FW) and mechanical press (33.01 mg/100 g FW).

The major sugars found in pomegranate juice were glucose and fructose. The fructose content of juice was higher than glucose content in all the cultivars with the highest in White Don Wade cultivar using blender (58.30 mg/mL) and mechanical press (55.44 mg/mL). The fructose content was in the range between 22.81 - 58.30 mg/mL for blender and 22.48 - 55.44 mg/mL for mechanical press. The glucose content varied between 11.94 - 47.78 mg/mL in

blender and 10.70 - 45.59 mg/mL in mechanical press. Citric acid was the predominant organic acid found in all the cultivars extracted with blender and mechanical press, accounting for approximately 49.48% of the total acids quantified in majority of the cultivars. The other major organic acids are malic, tartaric, succinic, ascorbic, and oxalic acids. A variety of phenolic compounds were identified in the samples which primarily consisted of hydrolyzable tannins like gallic acid, ellagic acid, and punicalagin; phenolic acids such as caffeic, *p*-coumaric, and ferulic acids; and flavonoids such as catechins, epicatechin, and quercetin. The overall mean concentrations of phenolic compounds were as follows: for blender, gallic acid 159.19, catechin 64.01, epicatechin 21.72, caffeic acid 21.51, *p*-coumaric acid 6.00, ferulic acid 1.85, ellagic acid 30.79, punicalagin 140.63, quercetin 17.70 mg/100 g FW; for mechanical press, gallic acid 108.25, catechin 45.64, epicatechin 12.73, caffeic acid 18.91, *p*-coumaric acid 4.78 mg, ferulic acid 1.50, ellagic acid 22.72, punicalagin 82.13, quercetin 16.53 mg/100 g FW.

We identified three to five cultivars that performed fairly well—however, the two with the most performance consistency were “Nikitski ranni” and “Cranberry.” This information was informally relayed to growers through the GPA meetings.

As there are a variety of different issues to consider, our viewpoint is that the Georgia Pomegranate Association needs to take the results of this project and make a determination of which cultivar(s) should be considered for planting in Georgia.

Beneficiaries and How They Benefited

The beneficiaries of the results of this project are from the Georgia Pomegranate Association (GPA), comprised primarily of blueberry growers seeking to diversify their operations by taking advantage of the emerging pomegranate specialty crop production in Georgia. At this point, we do not know specifically how many beneficiaries of the project have accessed and utilized the results of this study. We did make presentations to GPA, and some of the farmers did visit with us later. Once the results of this study is published, however, the number of beneficiaries should increase.

The results of this study demonstrate that the use of blender will result in higher juice yield and greater antioxidant capacity compared to the mechanical press (Table 1). Overall, cultivar Cranberry, showed good juice characteristics based on total polyphenol content and antioxidant capacity. Analyzing the different pomegranate cultivars in Georgia, in terms of yield, antioxidant capacity, organic acid, and sugars content will enable breeders to selectively breed, propagate and commercialize certain cultivars in terms of phytonutrient and health beneficial compounds. The data obtained from this grant is necessary to the industry prior to making significant capital investment in large scale planting of the desirable pomegranate varieties in Georgia.

Lessons Learned

Different pomegranate cultivars exhibit different characteristics. The dark red colored arils showed good potential for commercial juice production. Separation of aril juice into different fractions of phenolic acids and flavonoids may result in better discussion of the juice's antioxidant capacity. Storage studies of the juice and its stability over time needs to be evaluated to better understand the stability of phenolic compounds.

Additional information

http://www.caes.uga.edu/applications/gafaces/?public=viewStory&pk_id=3958

http://www.caes.uga.edu/Applications/ImpactStatements/index.cfm?referenceInterface=IMPACT STATEMENT&subInterface=detail_main&PK_ID=3163

Contact person for the project

Dr. Casimir C. Akoh
Telephone: 706-542-1067
Email: cakoh@uga.edu

References

AOAC. (1990). Official Methods of Analysis, 15th ed., VA, USA: Association of Official Analytical Chemists, Arlington.

Benzie, I., & Strain, J. (1996). The ferric reducing ability of plasma (FRAP) as a measure of "antioxidant power": The FRAP assay. *Analytical Biochemistry*. 239, 70-76.

Chen, Z. G., En, B. T., & Zhang, Z. Q. (2006). Simultaneous determination of eight organic acids in *Fructus mume* by RP-HPLC. *Zhongguo Zhong Yao Za Zhi*, 31, 1783-1786.

Lee, K. W., Kim, Y. J., Kim, Dae-ok., Lee, H. J., & Lee, C. Y. (2003). Major phenolics in apple and their contribution to the total antioxidant capacity. *Journal of Agricultural and Food Chemistry*, 51, 6516-6520.

Martens, D. A., & Frankenberger, W. T. (1991). Determination of aminosaccharides by high-performance anion-exchange chromatography with pulsed amperometric detection. *Talanta*, 38, 245-251.

Pastrana-Bonilla, E., Akoh, C. C., Sellappan, S., & Krewer, G. (2003). Phenolic content and antioxidant capacity of muscadine grapes. *Journal of Agricultural and Food Chemistry*, 51, 5497-5503.

Prior, R. L., Hoang, H., Gu, L., Wu, X., Bacchiocca, M., Howard, L. et al., (2003). Assays for hydrophilic and lipophilic antioxidant capacity (oxygen radical absorbance capacity (ORAC(FL)) of plasma and other biological and food samples. *Journal of Agricultural and Food Chemistry*, 51, 3273-3279.

Singleton, V. L., & Rossi, J. A. J. (1965). Colorimetry of total phenolics with phosphomolybdic-phosphotungstic acid reagents. *American Journal of Enology and Viticulture*, 16, 144-158.

22. SUSTAINABLE GEORGIA FOOD FOR A SUSTAINABLE GEORGIA FUTURE – GEORGIA ORGANICS – FINAL PERFORMANCE REPORT

Project Summary

Georgia Organics was the recipient of a \$40,000 grant funded from the 2009 Specialty Crop Block Grant to improve the competitiveness of Georgia's burgeoning local and organic farming industry. The grant's funds were used to pursue a creation of a comprehensive, resource-based website, host Georgia Organics 2010 conference and the creation and distribution of the 2011-2012 Local Food Guide. The following represents a final report on these three initiatives.

Website - Mid November 2010 the website was officially launched, in January - February the website was tested and all the bugs were worked out.

Conference - In February 2010, the 13th Annual Conference was held in Athens, Georgia hosting over 1200 attendees.

Local Food Guide - In March 2011 the Local Food Guide was launched. Walton Press printed 60,000 copies which will be distributed from 2011-12.

Approach

Website - In mid-November 2010, Georgia Organics launched a new dynamic and resource-based website to better educate and connect growers, consumers and businesses.

Conference - Georgia Organics hosted the southeast's largest sustainable agriculture event in February 2010.

Local Food Guide - Georgia Organics has completed the 2011-2012 Local Food Guide, a flagship publication for the organization and the only one of its kind in Georgia.

Goals and Outcomes Achieved

Website -

The new website features one of the most comprehensive collections of grower resources and farmer education tools in the southeast that leverage web-based technology. From March to December 15, 2011 the website received 48,000 unique visitors, 78,000 visits and 290,000 unique page views. The goal of 7.5 million visitors has been revised to more realistic expectations.

Georgia Organics website is also now serving as a repository for clips on the event itself, the keynote presentation and individual workshops. Growers, particularly that not in attendance, will have access these resources at no cost to leverage the excellent speakers and their expertise on key topics presented at the conference.



In the [farmer resources section](#), farmers can find the following core subpages that offer an overview with links to robust information and fact sheets. The new website offers easy navigations of Georgia Organics curriculum.

- o [Farm Overview Crop](#)

[Production](#)

- o [Livestock Production](#)
- o [Certifications](#)
- o [Grants and Cost Shares](#)
- o [Mentoring Program](#)
- o [Urban Ag Training](#)
- o [Farmers Markets](#)
- o [Organic Growing Curriculum](#)

Additionally, this website enables Georgia Organics to host the most up-to-date growing information available on the web, from climate information to pest management practices, and dozens of other topics that impact farmers across the southeast.

Twenty-three pages of the Farmers Resource section received over 5,585 unique visitors. This resource offers direct access to practical training materials, and an active online forum which discusses pertinent issues and answers questions on sustainable production

practices. The website also serves to link farmers with consumers and institutions seeking locally grown organic food with farms. Grower resource pages increased from 1 page to over 75 pages making it the most information resource for grower education.

The website also highlighted information on Georgia Organics 14th annual conference in 2011 which was attended by 1,100 attendees which included 676 farmers.

The Communications Committee, staff and key members of the board and farmers members of the board assessed the development of the website as it was being tested. Through the Communications Committee promotions were created and placed in all on-line communications and in the DIRT newsletter announcing the new website was now operational. Also, press outreach promotions were sent to Atlanta Magazine.

2010 Annual Conference -

As discussed below, our initial proposed target increase in attendance and participation had to be broken down a little differently.

The conference sold out for the fourth year in a row, hosting the largest crowd in its 13 year history **1,200 in attendance from 22 states and almost every county in Georgia**. Of the attendees, 643 represented a farm or agriculture-related organization.

Conference

The final docket of educational offerings featured 36 educational sessions, 8 in-depth workshops, and 10 regional farm tours with 60 outstanding international, national and regional speakers. The Conference was also host the largest sustainable and organic agriculture Trade Show in the southeast with 70 vendors.

2 Full Days • 1 Great Value

10 Distinct Tours, Visiting
11 Farms
 2 Research Stations
5 Gardens
 2 Restaurants 3 Mules

70+ Presenters
 70 Exhibitors
 9 In-depth Workshops
 9 Tracks, Including 1 Just For Children
 36 Education Sessions
 4 Local Sustainable Meals
 2 Book Signings
 1 Farmers Feast

Evaluations were extremely positive, continuing Georgia Organics trend of offering growers instructive and valuable experiences. Below is a 5-year comparison of major conference benchmarks:

Year	# of Attendees	% of Attendees From Outside GA	# of Workshops Offered	Evaluation Rating (1 lowest - 5 highest)	# of Trade Show Exhibitors
2006	325	10%	23	4.6	13
2007	465	11%	22	4.8	34
2008	700	16%	32	4.62	60
2009	1100	14%	38	4.6	50
2010	1200	10%	40	4.63	70

Understanding that many limited-resource growers require assistance to attend educational events such as this conference, Georgia Organics aggressively marketed and offered conference scholarships and cost off-setting opportunities. In total 49 farmers, 7 county extension agents, 15 agriculture educators and 14 agriculture students were provided full scholarships to attend the entire conference. Additional support for growers included arranging home stays, carpools and promoting public transportation to the conference facility.

The Conference Trade Show/Expo was the largest in the southeast featuring 70 vendors. These vendors represented a diverse mix of academics, farmer-focused production products, state and federal agencies sharing resources, distributors and farmers markets seeking farmers, and non-profit organizations in the sustainable agriculture movement.

Based on feedback from prior years to increase the amount of time attendees have to browse and interface with vendors, the Trade Show space was set up in conjunction with all meal service and dining, was open throughout the conference, and had a dedicated reception Friday evening open to conference attendees and the general public for the first time in conference history.

Virtual promotion and social media were also highlighted improvements from past years. The goal was to engage individuals unable to attend the conference through real-time discussions and resource-sharing online. For the first time ever, the Georgia Organics conference hosted an online hub aggregating content from conference participants through facebook, twitter and flickr. During the conference promotional period (October 2009-February 2010), www.georgiaorganics.org received 14,595 unique visits to the main conference page.

Aside from promotion through our partners, approximately ten media placements including Georgia Public Broadcasting, Atlanta Journal Constitution, Gainesville Times, Athens Banner-Herald, Il Repubblicana (Italian newspaper) and 11Alive news were secured prior to, during and after the conference on a variety of angles including features of local successful farms, interest in organic farming among young people, and the work of Georgia Organics.

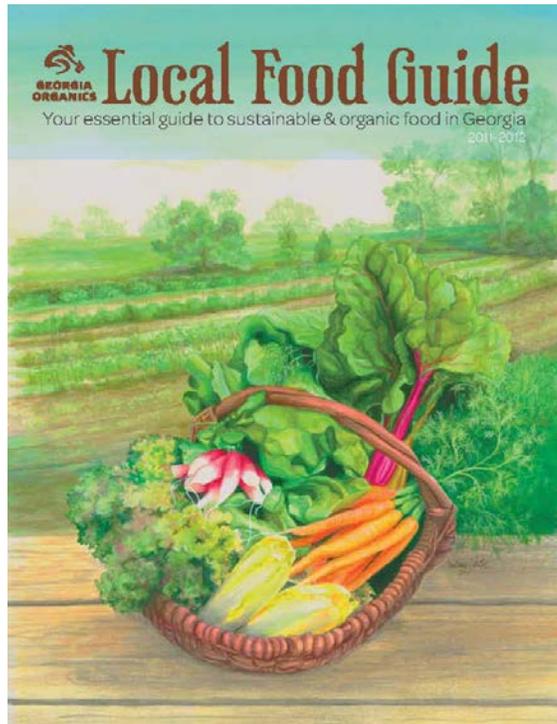
Carlo Petrini, founder of the international Slow Food movement, addressed the attendees Saturday evening, February 20th at the Farmers Feast. Petrini's address was pertinent to all members of the food system from farmers, to distributors, chefs and consumers, who he calls "co-producers." His remarks focused on the theme of organic agriculture and its value to farmers, eaters, the



environment and the economy. He also talked about resurrecting distribution chains that respect the farmer and support farmers making a decent and sustainable living wage.

Local Food Guide

The Local Food Guide was released in March 2011 at the Georgia Organics 14th annual conference in Savannah, GA. Walton Press printed 60,000 copies of the guide and the two-year publication will be distributed throughout 2011-2012. The guide's content mirrors the organization website in a searchable format. The guide features 75 restaurants serving local and organic food, 96 farmers markets, 174 farms and 40 businesses related to sustainable and organic agriculture. The Local Food Guide distribution points increased to over 200 locations and the number of listings in the Local Food Guide increased up to 25%.



Beneficiaries

Website - restaurant community markets, professionals, local businesses, organizations

Consumers, farms, owners, CSA, gardens, farmers agricultural

Conference - Consumers, agricultural educators, agricultural students, limited resource farmers, farmers, culinary professionals, teachers, parents, organizations

Local Food Guide - general public, restaurants, CSA, restaurant owners, community gardens, farmers markets, agricultural professionals, advertisers, farms, local businesses, organizations

Lessons Learned

The Georgia Organics' website, annual conference, and local food guide are the most important tools Georgia Organics uses to reach a vast audience and provide growers and consumers with educational skills and tools, an online discussion board, create visibility and markets for sustainable and organic farmers and provide resources to access local organic and sustainable food. Georgia Organics is grateful to the Georgia Department of Agriculture and the Specialty Crop Block Grant program for investing in these critical resources.

Georgia Organics expended \$41,226 for the website's development and integration. ***Specialty Crop funds of \$15,000 were applied to these expenses with the remaining portion being paid from private sources.***

Georgia Organics expended \$46,788 in total Local Food Guide production costs. Design and printing totaled \$28,215 and personnel expenses totaled \$18,573 for a Local Food Guide intern and existing staff time allocated to the project. ***Funding of \$15,000 was used from the Specialty Crop Grant for these costs.***

Specialty crop funds in the amount of \$10,000 were applied to provide funding for the annual 2010 Georgia Organics conference. Georgia Organics provided cash in-kind support totaling \$50,000.

All of the specialty crop block grant funds were used solely for the promotion of specialty crops. All non-specialty crop promotion costs were paid for by Georgia Organics, cash or in-kind donations, or other private sources.

Contact

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Southeast Regional Fruit & Vegetable Conference

January 7-10, 2010
Savannah, GA



Peach Conference

SATURDAY, JANUARY 9, 2010

- 8:30-2:30 p.m. ATTENDEE REGISTRATION OPEN
Riverview Concourse
- 9:00 a.m. GENERAL SESSION - Auditorium
- 10:30-2:30 a.m. TRADE SHOW OPEN
- 12:00-1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Saturday
Only Registrants)
- 2:00 p.m. SILENT AUCTION CLOSSES
- 2:30 p.m. TRADE SHOW CLOSSES
- 2:00-4:00 p.m. EDUCATIONAL SESSION - Rooms 105/106
PEST MANAGEMENT II
Moderator: Mr. Andy Rollins, Clemson University,
Spartanburg, SC
- 2:00 p.m. Stink Bugs: Seasonal Occurrence and
Insecticide Efficacy
Dr. Ted Cottrell, USDA, Byron, GA and
Dr. Dan Horton, University of Georgia, Athens, GA
- 2:30 p.m. World Wide Web Supported Brown Rot
Management for Southeastern Peach Growers
Dr. Guido Schnabel, Clemson University,
Clemson, SC
- 3:00 p.m. Brown Rot: Management and Survey Results Dr.
Phil Brannen, University of Georgia, Athens, GA
and Dr. Guido Schnabel, Clemson University,
Clemson, SC
- 3:30 p.m. Tall Fescue: A Non-chemical Alternative to Root
Knot Nematode Control
Dr. Andy Nyczepir, USDA, Byron, GA; Dr. Susan
Meyer, USDA, Beltsville, MD; and
Frank Funderburk, University of Georgia,
Fort Valley, GA
- 4:00 p.m. GEORGIA AND SOUTH CAROLINA PEACH
COUNCIL BUSINESS MEETING -
Rooms 105/106
- 6:00-7:00 p.m. RECEPTION sponsored by Syngenta -
Westin Savannah Harbor
(Open to All Attendees)
- Evening DINNER ON YOUR OWN

SUNDAY, JANUARY 10, 2010

- 8:00-8:30 a.m. WORSHIP SERVICE
Westin Savannah Harbor
- 8:30 a.m. INDUSTRY ROUNDTABLE (all associations)
Westin Savannah Harbor
Continental breakfast with fellow growers to
discuss industry issues.
- 10:30 a.m. CONVENTION ADJOURNS

HAVE A SAFE TRIP HOME!

Vegetable Conference

All Activities at the Savannah International Trade & Convention Center (SITCC) unless otherwise noted.

THURSDAY, JANUARY 7, 2010

- 8:00 - 5:00 p.m. EXHIBITOR REGISTRATION OPEN
Riverview Concourse
Exhibitor and Poster Set-Up
- 1:30 p.m. GFVGA BOARD OF DIRECTORS MEETING
Jasper Board Room
- 4:00 p.m. GFVGA ANNUAL MEETING
Room 205

FRIDAY, JANUARY 8, 2010

- 7:00 - 5:00 p.m. ATTENDEE REGISTRATION OPEN
Riverview Concourse
- 7:00 - 10:00 a.m. EXHIBITOR MOVE IN
Exhibitors must be in place by 9:00 a.m.
- 8:00 - 9:00 a.m. EDUCATIONAL SESSION I - Rooms 103/104
IRRIGATION AND WATER USE
Moderator: Mr. Justin Shealey, County Extension
Coordinator, Echols County, GA
- 8:00 a.m. Comparing Vegetable Yields as Affected By
Water Quantity
Gary Hawkins, University of Georgia, Tifton, GA
- 8:20 a.m. Irrigation Effects on Sweet Corn Yield and Quality
Rad Yager, University of Georgia, Dougherty County
Extension, Albany, GA
- 8:40 a.m. Forecasting Georgia's Irrigation Water Needs
Jim Hook, University of Georgia, Tifton, GA
- 9:00 a.m. BREAK
- 9:20 - 11:00 a.m. EDUCATIONAL SESSION II - Rooms 103/104
ONION PRODUCTION
Moderator: Mr. Shane Curry, County Extension
Coordinator, Montgomery County, GA
- 9:20 a.m. Herbicide Carryover Studies in Onions
Tim Grey, University of Georgia, Tifton, GA
- 9:40 a.m. Effect of Fungicide Dip Treatments on Fungal
Diseases and Yield of Transplanted Vidalia
Onions
Hunt Sanders, University of Georgia, Tifton, GA

- 10:00 a.m. Weed Management in Organic Vidalia Onions
Carroll Johnson, USDA-ARS, Tifton, GA
- 10:20 a.m. Plant Spacing Effects on Onion Yields and Quality
Cliff Riner, University of Georgia Tattall County
Extension, Reidsville, GA
- 10:40 a.m. Onion Power - Potential Production of Biofuels
from Onions and Other Vegetables
Gary Hawkins, University of Georgia, Tifton, GA
- 10:00 - 6:00 p.m. TRADE SHOW OPEN
- 11:00-12:00 p.m. PRODUCT RECALL CRISIS
MANAGEMENT FORUM - Auditorium
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Friday Only
Registrants)
- 1:30 - 2:40 p.m. EDUCATIONAL SESSION III - Rooms 103/104
VEGETABLE DISEASES
Moderator: Mr. Tim Flanders, County Extension
Coordinator, Berrien County, GA
- 1:30 p.m. Bacterial Spot Resistance in Bell Pepper
Jeff Jones, University of Florida, Gainesville, FL
- 2:00 p.m. Tomato Spotted Wilt Virus and Tomato Yellow Leaf
Curl: Factors Influencing Vector Populations
and Virus Epidemiology in South Georgia's
Vegetable Production System
Babu Srinivasan, University of Georgia, Tifton, GA
- 2:20 p.m. Integrated Management of Phytophthora Blight
Caused by Phytophthora capsici on Vegetable
Updates
Pingsheng Ji, University of Georgia, Tifton, GA
- 2:40 p.m. BREAK
- 3:00 - 4:30 p.m. EDUCATIONAL SESSION IV - Rooms 103/104
PESTICIDE UPDATE AND VEGETABLE
COMMODITY COMMISSION RESEARCH AT
UNIVERSITY OF GEORGIA
Moderator: Mr. Brian Tankersley, County
Extension Coordinator, Tift County, GA
- 3:00 p.m. Fungicide Update for Georgia Vegetables and
Commodity Commission Research
David Langston, University of Georgia, Tifton, GA
- 3:30 p.m. Insecticide Update for Georgia Vegetables and
Commodity Commission Research
Stormy Sparks, University of Georgia, Tifton, GA

Vegetable Conference

- 4:00 p.m. Herbicide Update for Georgia Vegetables and Commodity Commission Research
Stanley Culpepper, University of Georgia, Tifton, GA
- 4:45 p.m. WELCOME RECEPTION - TRADE SHOW AREA
(Open to all registered attendees)
- 5:45 p.m. LIVE AUCTION IN EXHIBIT HALL
- 6:00 p.m. TRADE SHOW CLOSES
- Evening DINNER ON YOUR OWN

SATURDAY, JANUARY 9, 2010

- 8:30 - 2:30 p.m. REGISTRATION OPEN
Riverview Concourse
- 9:00 a.m. GENERAL SESSION – Auditorium
- 10:30 - 2:30 p.m. TRADE SHOW OPEN
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Saturday Only Registrants)
- 2:00 p.m. SILENT AUCTION CLOSES
- 2:00 - 3:00 p.m. EDUCATIONAL SESSION V - Rooms 103/104
VEGETABLE INSECTS
Moderator: Mr. Phillip Edwards, County Extension Coordinator, Irwin County, GA
- 2:00 p.m. 2009 Studies on Thrips Control and Host Plant Resistance for Managing Tomato Spotted Wilt in Tomato and Pepper
David Riley, University of Georgia, Tifton, GA
- 2:20 p.m. New Chemical Alternatives for Managing Insect Pests in Vegetables
John Palumbo, University of Arizona, Yuma, AZ;
David Schuster, University of Florida, Wimauma, FL
- 2:40 p.m. Pollination Needs in Vegetables
Keith Fielder, University of Georgia, Putnam County Extension, Eatonton, GA
- 3:00 p.m. BREAK
- 3:30 - 4:30 p.m. EDUCATIONAL SESSION VI - Rooms 103/104
SOIL FUMIGANTS AND ALTERNATIVES
Moderator: Mr. Tucker Price, County Extension Coordinator, Crisp County, GA

- 3:30 p.m. Everything You Ever Wanted to Know About Buffer Zones and Were Afraid to Ask
Paul Sumner, University of Georgia, Tifton, GA
- 3:45 p.m. Methods of Controlling Soil-Borne Pests of Vegetables Utilizing Non-Fumigant Pesticides
David Langston, University of Georgia, Tifton, GA
- 4:00 p.m. Methyl Bromide Alternatives Including the UGA 3-Way, Paladin (a New Fumigant) and a New Alternative in Development
Stanley Culpepper, University of Georgia, Tifton, GA;
Richard Keigwin, Director of Pesticide Re-evaluation Division of USEPA, Washington, DC

- 2:30 p.m. TRADE SHOW CLOSES

- 6:00 p.m. RECEPTION sponsored by Syngenta - Westin Savannah Harbor
(Open to All Attendees)

- Evening DINNER ON YOUR OWN

SUNDAY, JANUARY 10, 2010

- 8:00 - 8:30 a.m. WORSHIP SERVICE - Westin Savannah Harbor
- 8:30 a.m. INDUSTRY ROUNDTABLE (all associations)
Westin Savannah Harbor
Continental breakfast with fellow growers to discuss industry issues.
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- HAVE A SAFE TRIP HOME!

Vegetable Conference sponsored by:

Seminis®

Vidalia Onion Conference

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THURSDAY, JANUARY 7, 2010

- 8:00 - 5:00 p.m. EXHIBITOR REGISTRATION OPEN
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Exhibitor and Poster Set-Up
- 1:30 p.m. GFVGA BOARD OF DIRECTORS MEETING
Jasper Board Room
- 4:00 p.m. GFVGA ANNUAL MEETING
Room 205

FRIDAY, JANUARY 8, 2010

- 7:00 - 5:00 p.m. ATTENDEE REGISTRATION OPEN
Riverview Concourse
- 7:00 - 10:00 a.m. EXHIBITOR MOVE IN
Exhibitors must be in place by 9:00 a.m.
- 8:00 - 9:00 a.m. EDUCATIONAL SESSION I - Rooms 103/104
IRRIGATION AND WATER USE
Please see page 20
- 9:20 - 11:00 a.m. EDUCATIONAL SESSION II - Rooms 103/104
ONION PRODUCTION
- 9:20 a.m. Herbicide Carryover Studies in Onions
Tim Grey, University of Georgia, Tifton, GA
- 9:40 a.m. Effect of Fungicide Dip Treatments on Fungal
Diseases and Yield of Transplanted Vidalia
Onions
Hunt Sanders, University of Georgia, Tifton, GA
- 10:00 a.m. Weed Management in Organic Vidalia Onions
Carroll Johnson, USDA-ARS, Tifton, GA
- 10:20 a.m. Plant Spacing Effects on Onion Yields and
Quality
Cliff Riner, University of Georgia Tattnell County
Extension, Reidsville, GA
- 10:40 a.m. Onion Power - Potential Production of Biofuels
from Onions and Other Vegetables
Gary Hawkins, University of Georgia, Tifton, GA
- 10:00 - 6:00 p.m. TRADE SHOW OPEN
- 11:00-12:00 p.m. PRODUCT RECALL CRISIS
MANAGEMENT FORUM - Auditorium
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Friday Only Registrants)

1:30 - 2:40 p.m. EDUCATIONAL SESSION III - Rooms 103/104
VEGETABLE DISEASES
Please see page 20

3:00 - 4:30 p.m. EDUCATIONAL SESSION IV - Rooms 103/104
PESTICIDE UPDATE AND VEGETABLE
COMMODITY COMMISSION RESEARCH AT
UNIVERSITY OF GEORGIA
Please see page 20

4:45 p.m. WELCOME RECEPTION - TRADE SHOW
AREA (Open to all registered attendees)

5:45 p.m. LIVE AUCTION IN EXHIBIT HALL

6:00 p.m. TRADE SHOW CLOSES

SATURDAY, JANUARY 9, 2010

- 8:30 - 2:30 p.m. REGISTRATION OPEN - Riverview Concourse
- 9:00 a.m. GENERAL SESSION - Auditorium
- 10:30 - 2:30 p.m. TRADE SHOW OPEN
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Saturday Only
Registrants)
- 2:00 p.m. SILENT AUCTION CLOSES
- 2:00 - 2:40 p.m. EDUCATIONAL SESSION V - Rooms 103/104
VEGETABLE INSECTS
Please see page 21
- 3:20 - 4:20 p.m. EDUCATIONAL SESSION VI - Rooms 103/104
SOIL FUMIGANTS AND ALTERNATIVES
Please see page 21
- 2:30 p.m. TRADE SHOW CLOSES
- 6:00 p.m. RECEPTION sponsored by Syngenta -
Westin Savannah Harbor
(open to all attendees)

SUNDAY, JANUARY 10, 2010

- 8:00 - 8:30 a.m. WORSHIP SERVICE - Westin Savannah Harbor
- 8:30 a.m. INDUSTRY ROUNDTABLE (all associations)
Westin Savannah Harbor
Continental breakfast with fellow growers to
discuss industry issues.
- 10:30 a.m. CONVENTION ADJOURNS
HAVE A SAFE TRIP HOME!

Organic Production Conference

All Activities at the Savannah International Trade & Convention Center (SITCC) unless otherwise noted.

THURSDAY, JANUARY 7, 2010

- 8:00 - 5:00 p.m. EXHIBITOR REGISTRATION OPEN
Riverview Concourse
Exhibitor and Poster Set-Up
- 1:30 p.m. GFVGA BOARD OF DIRECTORS MEETING
Jasper Board Room
- 4:00 p.m. GFVGA ANNUAL MEETING - Room 205

FRIDAY, JANUARY 8, 2010

- 7:00 - 5:00 p.m. ATTENDEE REGISTRATION OPEN
Riverview Concourse
- 7:00 - 10:00 a.m. EXHIBITOR MOVE IN
Exhibitors must be in place by 9:00 a.m.
- 8:00 - 10:15 a.m. ORGANIC SESSION I - Rooms 100/101
ORGANIC BLUEBERRY PRODUCTION
- 8:00 a.m. Update on Alapaha and Alma Organic Blueberry
Dr. Moukarm Tetuliano, University of Georgia,
Tifton GA
- 8:20 a.m. Organic Growth-stage Pest Management Guide
Dr. Harald Scherm and Dr. Dan Horton,
University of Georgia, Athens, GA
- 8:50 a.m. Organic Blueberry Production: The Farmer's
Perspective
Dan Ebbecke, Blueberry Farmer, Masaryktown, FL
- 9:10 a.m. Organic Blueberry Production in New Jersey
Dr. Bill Sciarappa, Rutgers University, Freehold, NJ
- 10:00 - 6:00 pm TRADE SHOW OPEN
- 10:15 a.m. BREAK
- 10:45 - 11:45 a.m. ORGANIC SESSION II - Rooms 100/101
SUCCESSFUL ORGANIC FARMING:
PRODUCTION TECHNIQUES - PART I
Moderator: Relinda Walker
- 10:45 a.m. Grafting Heirloom Tomatoes on Disease
Resistant Rootstock
Cary Rivard, North Carolina State University,
Raleigh, NC

- 11:00 - 12:00 p.m. PRODUCT RECALL CRISIS
MANAGEMENT FORUM - Auditorium
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Friday Only
Registrants)
- 1:30 - 3:00 p.m. ORGANIC SESSION III - Rooms 100/101
SUCCESSFUL ORGANIC FARMING:
PRODUCTION TECHNIQUES - PART II
Moderator: Calvin Willis, Lowndes County
Extension Agent
- 1:30 p.m. High Tunnel Production for Season
Extension
Dr. George Boyhan, University of Georgia,
Athens, GA
- 2:00 p.m. Trap Crops and Farmscaping
Dr. John Ruberson, University of Georgia,
Tifton, GA
- 2:30 p.m. Successful Organic Production -
The Farmer's Perspective
- 3:00 p.m. BREAK
- 3:15- 4:45 p.m. ORGANIC SESSION IV - Rooms 100/101
SUCCESSFUL ORGANIC FARMING:
MARKETING AND FARM BILL SUPPORT
Moderator: Ray Hicks, Screven County
Extension
- 3:15 p.m. Marketing Organic to Retailers and Wholesalers
Presentations and Panel Discussion
Whole Foods – Alex Rilko
Destiny Produce – Dee Dee Digby
- 4:15 p.m. 2008 Farm Bill – Programs to Help with
Transitioning to Organic
NRCS – Deena Roberts and Bryan Barrett
- 4:45 p.m. WELCOME RECEPTION - TRADE SHOW AREA
(Open to all registered attendees)
- 5:45 p.m. LIVE AUCTION IN EXHIBIT HALL
- 6:00 p.m. TRADE SHOW CLOSES
- Evening DINNER ON YOUR OWN

Please review other Conference Agendas for additional educational sessions, trade show events, spouse activities and entertainment opportunities during the Saturday and Sunday programs that you don't want to miss.

Blackberry & Raspberry Conference

All activities at the Savannah International Trade and Convention Center (SITCC) unless otherwise noted.

THURSDAY, JANUARY 7, 2010

- 8:00 - 5:00 p.m. EXHIBITOR REGISTRATION OPEN
Riverview Concourse
Exhibitor and Poster Set-Up
- 9:00 - noon CONCURRENT WORKSHOPS
Attendance is limited. Places cannot be guaranteed for walk-in registrants.
- Workshop I - Room 203
Getting Started in the Blackberry Business
Caneberry Basics / The Plan Before The Planting / Blackberry Production: From Site Prep to First Harvest / Pests You Can't Ignore / Developing a Market. This workshop focuses especially on smaller-scale production for local and direct markets. For growers just thinking about it through those in their first few years of production. Fee includes a resource notebook.
Wayne Mitchem, NCSU/UGA/Clemson and grower, Mitchem's Farm, Vale, NC; Guy Moore, Larriland Farm, Woodbine, MD; David Lockwood, University of Tennessee, Knoxville, TN; Josh Beam, Sunny Ridge Farm, Lincolnton, NC
- Workshop II - Room 205
Caneberry Marketing Strategies
PYO, Direct, local, wholesale...what choice or combination is best for you? Developing a "Go To Market" Strategy. Types of Agreements, how to negotiate them and resolve issues. Open to both new and experienced growers.
John Shelford, Shelford Associates/FreshXperts, Naples, FL; Ervin Lineberger, North American Raspberry & Blackberry Association, Kildeer Farm, Kings Mountain, NC; Marketing Specialist, US Department of Agriculture, PACA
- 12:00 p.m. LUNCH
Sandwiches, snacks and drinks will be available at the Convention Center
- 1:30 p.m. GFVGA BOARD OF DIRECTORS MEETING
Jasper Board Room

- 1:30 - 5:00 p.m. EDUCATIONAL SESSIONS - Rooms 203/204
No pre-registration required. Open to all conference attendees.
- 1:30 p.m. Understanding Viruses & Developing a Strategy for Viruses on Your Farm Yannis Tzanetakis, University of Arkansas, Fayetteville, AR; Zvezdana Pesic-VanEsbroeck, North Carolina State University Department of Plant Pathology, Raleigh, NC
- 2:30 p.m. Post-harvest Handling & Evaluation of Blackberries: Which Varieties Work for You? Penny Perkins-Veazie, North Carolina State University Plants for Human Health Institute, Kannapolis, NC
- 3:15 p.m. BREAK
- 3:30 p.m. Pollination of Blackberries & Insect Update Hannah Burrack, North Carolina State University, Raleigh, NC
- 4:00 p.m. Grower Panel: How Blackberries Work for Us Guy Moore, Larriland Farm, Woodbine, MD; Ben Strickland & Michelle Patten, Lakeland, GA and Shelby, NC
- 4:00 p.m. GFVGA ANNUAL MEETING
Room 205
- 6:00 p.m. BRAMBLE GROWERS DINNER
Dutch treat. Location to be announced.

This program is coordinated in partnership with the North American Raspberry and Blackberry Association.

Blackberry & Raspberry Conference

FRIDAY, JANUARY 8, 2010

- 7:00 - 5:00 p.m. ATTENDEE REGISTRATION OPEN
Riverview Concourse
- 7:00 - 10:00 a.m. EXHIBITOR MOVE IN
Exhibitors must be in place by 9:00 a.m.
- 8:00 - 11:00 a.m. EDUCATIONAL SESSIONS - Rooms 203/204
- 8:00 a.m. Industry Updates - What's New and Important for the Blackberry & Raspberry Industry, from Pest Control to Policy
Ervin Lineberger, President of NARBA, and other presenters
- 8:45 a.m. Blackberry Varieties and New Developments In the Southeast: Success and Potential
John R. Clark, University of Arkansas, Fayetteville, AR
- 9:30 a.m. Just What's Happening Out There?
Implications of Blackberry Volume and Price Behavior in Commercial Shipping Markets
Mike Thomsen, Department of Agricultural Economics & Agribusiness, University of Arkansas, Fayetteville, AR
- 10:00 a.m. Developing Industry-wide Promotion for Blackberries - Panel and Roundtable Discussion
John Shelford, Shelford Associates/FreshXperts, Naples, FL; Keith Mixon, SunnyRidge Farm, Winterhaven, FL; Phil Neary, Sunny Valley International, Glassboro, NJ; Tom Krugman, Washington Red Raspberry Commission, Lynden, WA
- 10:00 - 6:00 p.m. TRADE SHOW OPEN
- 11:00-12:00 p.m. PRODUCT RECALL CRISIS MANAGEMENT FORUM - Auditorium
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Friday Only Registrants)
- 4:45 p.m. WELCOME RECEPTION - TRADE SHOW AREA
(Open to all registered attendees)
- 5:45 p.m. LIVE AUCTION IN EXHIBIT HALL
- 6:00 p.m. TRADE SHOW CLOSES
- Evening DINNER ON YOUR OWN

SATURDAY, JANUARY 9, 2010

- 8:30 - 2:30 p.m. REGISTRATION OPEN
Riverview Concourse
- 9:00 a.m. GENERAL SESSION – Auditorium
- 10:30 - 2:30 p.m. TRADE SHOW OPEN
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Saturday Only Registrants)
- 2:00 p.m. SILENT AUCTION CLOSES
- 2:30 p.m. TRADE SHOW CLOSES
- 6:00 p.m. RECEPTION sponsored by Syngenta -
Westin Savannah Harbor
(open to all attendees)
- Evening DINNER ON YOUR OWN

SUNDAY, JANUARY 10, 2010

- 8:00 - 8:30 a.m. WORSHIP SERVICE - Westin Savannah Harbor
- 8:30 a.m. INDUSTRY ROUNDTABLE (all associations)
Westin Savannah Harbor
Continental breakfast with fellow growers to discuss industry issues.
- 10:30 a.m. CONVENTION ADJOURNS

HAVE A SAFE TRIP HOME!

This program is coordinated in partnership with the North American Raspberry and Blackberry Association.

Muscadine Conference

All Activities at the Savannah International Trade & Convention Center (SITCC) unless otherwise noted.

THURSDAY, JANUARY 7, 2010

- 8:00 - 5:00 p.m. EXHIBITOR REGISTRATION OPEN
Riverview Concourse
Exhibitor and Poster Set-Up
- 1:30 p.m. GFVGA BOARD OF DIRECTORS MEETING
Jasper Board Room
- 4:00 p.m. GFVGA ANNUAL MEETING
Room 205

FRIDAY, JANUARY 8, 2010

- 7:00 - 5:00 p.m. ATTENDEE REGISTRATION OPEN
Riverview Concourse
- 7:00 - 9:00 a.m. EXHIBITOR MOVE IN
Exhibitors must be in place by 9:00 a.m.
- 10:00 - 6:30 p.m. TRADE SHOW OPEN
- 11:00-12:00 p.m. PRODUCT RECALL CRISIS
MANAGEMENT FORUM - Auditorium
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and FridayOnly
Registrants)
- 1:30 - 5:50 p.m. EDUCATIONAL SESSIONS - Room 102
ROADSIDE MARKETS
(See page 31)
- 4:45 p.m. WELCOME RECEPTION - TRADE SHOW AREA
(Open to all registered attendees)
- 5:45 p.m. LIVE AUCTION IN EXHIBIT HALL
- 6:00 p.m. TRADE SHOW CLOSES
- Evening DINNER ON YOUR OWN

SATURDAY, JANUARY 9, 2010

- 8:30 - 2:30 p.m. REGISTRATION OPEN
Riverview Concourse
- 9:00 a.m. GENERAL SESSION – Auditorium
- 10:30 - 2:30 p.m. TRADE SHOW OPEN
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Saturday Only
Registrants)

1:45 p.m. Business Meeting of the Georgia Muscadine
Association - Room 203
Mr. Charles Cowart, President, Arlington, GA

2:00 - 3:45 p.m. EDUCATIONAL SESSIONS - Room 203
Moderator: Patrick Conner, University of Georgia,
Tifton, Georgia

2:00 p.m. New Possibilities for the Postharvest Management
of Muscadine Pathogens
Dan MacLean, University of Georgia, Tifton, GA

2:30 p.m. Breeding Muscadine Grapes: A New Initiative
at the University of Arkansas
John Clark, University of Arkansas, Fayetteville, AR

3:00 p.m. BREAK

3:15 p.m. Herbicide Use in Muscadines
Wayne Mitchem, Mountain Horticultural Crops
Research and Extension Center, Fletcher, NC

3:45 p.m. Reestablishing Muscadine Grape Breeding at
North Carolina State University
Jim Ballington, North Carolina State University,
Raleigh, NC

6:00 p.m. RECEPTION sponsored by Syngenta -
Westin Savannah Harbor
(open to all attendees)

Evening DINNER ON YOUR OWN

SUNDAY, JANUARY 10, 2010

8:00 - 8:30 a.m. WORSHIP SERVICE - Westin Savannah Harbor

8:30 a.m. INDUSTRY ROUNDTABLE (all associations)
Westin Savannah Harbor
Continental breakfast with fellow growers to
discuss industry issues.

10:30 a.m. CONVENTION ADJOURNS

HAVE A SAFE TRIP HOME!

Pecan Conference

All activities at the Savannah International Trade and Convention Center (SITCC) unless otherwise noted.

THURSDAY, JANUARY 7, 2010

- 8:00 - 5:00 p.m. EXHIBITOR REGISTRATION OPEN
Riverview Concourse
Exhibitor and Poster Set-Up
- 1:30 p.m. GFFVA BOARD OF DIRECTORS MEETING
Jasper Board Room
- 4:00 p.m. GFFVA ANNUAL MEETING - Room 205

FRIDAY, JANUARY 8, 2010

- 7:00 - 5:00 p.m. ATTENDEE REGISTRATION OPEN
Riverview Concourse
- 7:00 - 10:00 a.m. EXHIBITOR MOVE IN
Exhibitors must be in place by 9:00 a.m.
- 10:00 - 11:30 p.m. EDUCATIONAL SESSIONS - Room 200
Presiding: Dr. Lenny Wells, University of Georgia
Extension Horticulturist-Pecans
- 10:00 a.m. Good Agricultural Practices for Pecan
Dr. Paul Bertrand, University of Georgia Extension
Pathologist - Retired, Tifton, GA
- 10:20 a.m. Pecan Diseases in a Wet Year
Dr. Tim Breneman, University of Georgia Plant
Pathology Department, Tifton, GA
- 10:40 a.m. Aphid Management After Imidacloprid
Dr. Will Hudson, University of Georgia Entomology,
Tifton, GA
- 11:00 a.m. Now That You've Thinned the Orchard, What's Next?
Dr. Bill Goff, Auburn University, Auburn, AL
- 10:00 - 6:00 p.m. TRADE SHOW OPEN
- 11:00-12:00 p.m. PRODUCT RECALL CRISIS
MANAGEMENT FORUM - Auditorium
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Friday Only
Registrants)
- 2:00 - 4:00 p.m. EDUCATIONAL SESSIONS - Room 200
- 2:00 p.m. Pecan Insurance 2010
Dr. Jeanne Lindsey, USDA-RMA
- 2:30 p.m. Conservation Security Program
Jimmy Bramblett, USDA-NRCS

- 2:50 p.m. BREAK
- 3:00 p.m. Legislative Update
Bob Redding, Redding and Associates,
Washington, D.C.
- 4:00 p.m. Business Meeting - Georgia Pecan
Growers Association - Room 200
Mr. Hilton, Segler, President
- 4:45 p.m. WELCOME RECEPTION - TRADE SHOW AREA
(Open to all registered attendees)
- 5:45 p.m. LIVE AUCTION IN EXHIBIT HALL
- 6:00 p.m. TRADE SHOW CLOSES
- Evening DINNER ON YOUR OWN

SATURDAY, JANUARY 9, 2010

- 8:30 - 2:30 p.m. REGISTRATION OPEN
Riverview Concourse
- 9:00 a.m. GENERAL SESSION – Auditorium
- 10:30 - 2:30 p.m. TRADE SHOW OPEN
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Saturday Only
Registrants)
- 2:00 p.m. SILENT AUCTION CLOSES
- 2:30 p.m. TRADE SHOW CLOSES
- 2:00 - 5:00 p.m. EDUCATIONAL SESSIONS
Review other Conference Agendas for additional
educational sessions that you don't want to miss.
- 6:00 p.m. RECEPTION sponsored by Syngenta -
Westin Savannah Harbor
(open to all attendees)
- Evening DINNER ON YOUR OWN

SUNDAY, JANUARY 10, 2010

- 8:00 - 8:30 a.m. WORSHIP SERVICE - Westin Savannah Harbor
- 8:30 a.m. INDUSTRY ROUNDTABLE (all associations)
Westin Savannah Harbor
Continental breakfast with fellow growers to discuss
industry issues.
- 10:30 a.m. CONVENTION ADJOURNS
- HAVE A SAFE TRIP HOME!

Blueberry Conference

All activities at the Savannah International Trade and Convention Center (SITCC) unless otherwise noted.

THURSDAY, JANUARY 7, 2010

- 8:00 - 5:00 p.m. EXHIBITOR REGISTRATION OPEN
Riverview Concourse
Exhibitor and Poster Set-Up
- 1:30 p.m. GFVGA BOARD OF DIRECTORS MEETING
Jasper Board Room
- 4:00 p.m. GFVGA ANNUAL MEETING - Room 205

FRIDAY, JANUARY 8, 2010

- 7:00 - 5:00 p.m. ATTENDEE REGISTRATION OPEN
Riverview Concourse
- 7:00 - 10:00 a.m. EXHIBITOR MOVE IN
Exhibitors must be in place by 9:00 a.m.
- 8:00 - 10:15 a.m. ORGANIC SESSION I - Rooms 100/101
ORGANIC BLUEBERRY PRODUCTION
- 8:00 a.m. Update on Organic Blueberry Mulching
Research at Alma and Comparison of
Organic vs Conventional Blueberry
Production at Alapaha, GA
Dr. Moukaram Tertuliano, University of Georgia,
Tifton, GA
- 8:20 a.m. Organic Growth-stage Pest Management Guide
Dr. Harald Scherm and Dr. Dan Horton,
University of Georgia, Athens, GA
- 8:50 a.m. Experiences with Organic Blueberry
Production in Florida
Dan Ebbecke, Blueberry Farmer,
Masaryktown, FL
- 9:10 a.m. Organic Blueberry Production in New Jersey
Dr. Bill Sciarappa, Rutgers University,
Freehold, NJ
- 10:00 - 6:00 p.m. TRADE SHOW OPEN
- 11:00-12:00 p.m. PRODUCT RECALL CRISIS
MANAGEMENT FORUM - Auditorium
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Friday Only
Registrants)

- 1:00 p.m. Georgia Blueberry Growers Association Business
Meeting - Auditorium
Mr. Steve Mullis President, Alma, GA
- 1:30 p.m.-4:40 p.m. EDUCATIONAL SESSIONS - Auditorium
Welcome: Speaker to be announced
Moderator: Mr. John Ed Smith, County Extension
Director, Pierce County, GA
- 1:30 p.m. Performance of Early Ripening Rabbiteye
Blueberries at Alapaha, GA
Drs. Gerard Krewer and Dan Maclean,
University of Georgia, Tifton, GA
- 1:50 p.m. 2009 Results with Mechanical Harvest of
Southern Highbush Blueberries, First Year
Results from Two Grants
USDA grant: Dr. Gerard Krewer, Dr. Fumi Takeda,
Dr. Dan Maclean, Mr. Lucky Mehra or Dr. Harald
Scherm, and Dr. Rob Shewfelt
Florida grant: Dr. Jeff Williamson
- 3:00 p.m. BREAK
- 3:20 p.m. Blueberry Production in Southern Europe
Mr. Cort Brazelton, Fall Creek Nursery,
Lowell, OR
- 4:00 p.m. Blueberry Cultivar Update and Potential
Release of a New Crispy Flesh Southern
Highbush Cultivar
Dr. Scott NeSmith, University of Georgia,
Griffin, GA
- 4:20 p.m. How Food Science Can Help the Blueberry
Industry
Dr. Robert Phillips, University of Georgia,
Griffin, GA
- 4:45 p.m. WELCOME RECEPTION -
TRADE SHOW AREA
(Open to all registered attendees)
- 5:45 p.m. LIVE AUCTION IN EXHIBIT HALL
- 6:00 p.m. TRADE SHOW CLOSES
- Evening DINNER ON YOUR OWN

Blueberry Conference

SATURDAY, JANUARY 9, 2010

- 8:30 - 2:30 p.m. REGISTRATION OPEN
Riverview Concourse
- 9:00 a.m. GENERAL SESSION - Auditorium
- 10:30 - 2:00 p.m. TRADE SHOW OPEN
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Saturday Only Registrants)
- 2:00 p.m. SILENT AUCTION CLOSES
- 2:00 - 4:40 p.m. EDUCATIONAL SESSIONS - Auditorium
Moderator: Mr. James Jacobs, Pierce County Extension Director, Blackshear, GA
- 2:00 p.m. Chemical Weed Control Rotations for Blueberries in Pine Bark Beds and Soil
Dr. Mark Czarnota, University of Georgia, Griffin, GA
- 2:20 p.m. "New" Pests to Watch Out For
Mr. Bill Cline, North Carolina State University, Castle Hayne, NC
- 2:40 p.m. Update on Xylella in Blueberries
Dr. Phil Brannen and Dr. Dan Horton, University of Georgia, Athens, GA
- 3:00 p.m. BREAK
- 3:15 p.m. Managing Blueberries for High Yields and Quality
Dr. Charles "Mike" Mainland, North Carolina State University, Castle Hayne, NC
- 3:45 p.m. Low Cost Pest Control Programs for Blueberries
Dr. Phil Brannen, Dr. Dan Horton, and Dr. Mark Czarnota, University of Georgia, Athens and Griffin, GA
- 4:15 p.m. Overview of Ag Data Collection Systems
Pet Tiger / Famous Software,
Mr. Randy Rinker, Mobile Farm Software;
Speaker to be announced
- 4:35 p.m. New Machinery for Blueberry Production
"Black Ice" harvester, Mr. Bernie Newton, BEI, South Haven, MI and Bennett-Mixon Hedger; Mr. Bennett, Bennett Tractor, Waycross, GA; and others

2:30 p.m. TRADE SHOW CLOSES

6:00 p.m. RECEPTION sponsored by Syngenta -
Westin Savannah Harbor
(open to all attendees)

Evening DINNER ON YOUR OWN

SUNDAY, JANUARY 10, 2010

8:00 - 8:30 a.m. WORSHIP SERVICE
Westin Savannah Harbor

8:30 a.m. INDUSTRY ROUNDTABLE (all associations)
Westin Savannah Harbor
Continental breakfast with fellow growers to discuss industry issues.

10:30 a.m. CONVENTION ADJOURNS

HAVE A SAFE TRIP HOME!

Food Safety Conference

All activities at the Savannah International Trade and Convention Center (SITCC) unless otherwise noted.

THURSDAY, JANUARY 7, 2010

- 8:00 - 5:00 p.m. EXHIBITOR REGISTRATION OPEN
Riverview Concourse
Exhibitor Set-Up and Poster Set-Up
- 1:30 p.m. GFVGA BOARD OF DIRECTORS MEETING
Jasper Board Room
- 4:00 p.m. GFVGA ANNUAL MEETING
Room 205

FRIDAY, JANUARY 8, 2010

- 7:00 - 5:00 p.m. ATTENDEE REGISTRATION OPEN
Riverview Concourse
- 7:00 - 10:00 a.m. EXHIBITOR MOVE IN
Exhibitors must be in place by 9:00 a.m.
- 8:30 - 10:25 a.m. EDUCATIONAL SESSIONS - Room 201
The Georgia Food Safety GAP (Good Agricultural Practices) Program can help you meet the requirements of a third party audit, serve as a marketing tool, or help you get that chain store business. Attend this workshop to learn more about one of the most critical issues in fruit and vegetable production – food safety. This workshop will fulfill the training requirement in the GAP audit.
- 8:30 a.m. What's the Difference Between All the Food Safety Audits and Companies
Dr. David Gombas, Sr. Vice President of Food Safety and Technology, United Fresh Produce Association, Washington, DC; Beth Bland, Georgia Fruit and Vegetable Growers Association, LaGrange, GA
- 8:50 a.m. National Leafy Greens Marketing Agreement
Charles Hall, Executive Director, Georgia Fruit and Vegetable Growers Association, LaGrange, GA
- 9:10 a.m. National Tomato Food Safety Guidelines
Walter Ram, Giumarra Company
- 9:35 a.m. Legislative Updates
Dr. David Gombas, Sr. Vice President of Food Safety and Technology, United Fresh Produce Association, Washington, DC

- 10:00 a.m. Produce Traceability Initiative
Elliott Grant and Chris Hogg, Harvest Mark, Perry, GA
- 10:50 a.m. BREAK
- 10:00 - 6:00 p.m. TRADE SHOW OPEN
- 11:00 - 12:00 p.m. PRODUCT RECALL CRISIS MANAGEMENT FORUM - Auditorium
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Friday Only Registrants)
- 1:30 - 4:00 p.m. EDUCATIONAL SESSIONS - Room 201
- 1:30 p.m. What is HACCP Based Food Safety Program?
Dr. Bill Hurst, University of Georgia, Athens, GA
- 2:00 p.m. Traceability and Recall Programs
Dr. David Gombas, Sr. Vice President of Food Safety and Technology, United Fresh Produce Association, Washington, DC
- 3:00 p.m. BREAK
- 3:15 p.m. What's A Mock Recall and How Do I Perform One?
Raina Nelson, Rosemont Farm, Inc., Plant City, FL
- 3:45 p.m. Microbiological Testing Programs in the Packing Facility and Demonstrations. Do I Need One? How to Create One? What Do They Prove?
Kurt Westmoreland, Siliker Labs, Inc., Atlanta, GA
- 5:00 - 6:30 p.m. WELCOME RECEPTION - TRADE SHOW AREA (Open to all registered attendees)
- Evening DINNER ON YOUR OWN

SATURDAY, JANUARY 9, 2010

- 8:30 - 2:30 p.m. REGISTRATION OPEN
Riverview Concourse
- 9:00 a.m. GENERAL SESSION - Auditorium
- 10:30 - 2:00 p.m. TRADE SHOW OPEN
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Saturday Only Registrants)

Food Safety Conference

- 1:20 p.m. STRAWBERRY EDUCATIONAL SESSIONS - Room 204
- 1:20 p.m. Food Safety for Pick-Your-Own Operations
Beth Bland, Georgia Fruit and Vegetable Growers Association, LaGrange, GA
- 2:00 - 3:40 p.m. EDUCATIONAL SESSIONS - Room 201
- 2:00 p.m. Food Safety Overview: What Does a Food Safety Program Consist of and How Do I Implement It?
Beth Bland, Georgia Fruit and Vegetable Growers Association, LaGrange, GA
- 2:45 p.m. What Are Corrective Actions?
Beth Bland, Georgia Fruit and Vegetable Growers Association, LaGrange, GA
- 3:00 p.m. What is Food Security?
Beth Bland, Georgia Fruit and Vegetable Growers Association, LaGrange, GA
- 3:15 p.m. How to Prepare for an Audit?
Beth Bland, Georgia Fruit and Vegetable Growers Association, LaGrange, GA
- 2:00 p.m. SILENT AUCTION CLOSES
- 2:30 p.m. TRADE SHOW CLOSES
- 6:00 p.m. RECEPTION sponsored by Syngenta - Westin Savannah Harbor (open to all attendees)
- Evening DINNER ON YOUR OWN
- SUNDAY, JANUARY 10, 2010
- 8:00 - 8:30 a.m. WORSHIP SERVICE
Westin Savannah Harbor
- 8:30 a.m. INDUSTRY ROUNDTABLE (all associations)
Westin Savannah Harbor
Continental breakfast with fellow growers to discuss industry issues.
- 10:30 a.m. CONVENTION ADJOURNS
- HAVE A SAFE TRIP HOME!

Roadside Markets Conference

Sponsored by the GA and SC Farm Bureaus

All Activities at the Savannah International Trade & Convention Center (SITCC) unless otherwise noted.

FRIDAY, JANUARY 8, 2010

- 7:00 - 5:00 p.m. ATTENDEE REGISTRATION OPEN
Riverview Concourse
- 10:00 - 6:00 p.m. TRADE SHOW OPEN
- 11:00-12:00 p.m. PRODUCT RECALL CRISIS MANAGEMENT FORUM - Auditorium
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Friday Only Registrants)
- 1:30 - 4:45 p.m. EDUCATIONAL SESSIONS - Room 102
- 1:30 p.m. Welcome and Overview
Brandon Ashley and Chalmers Mikell, Georgia and South Carolina Farm Bureau
- 1:40 p.m. Georgia Certified Farm Market Operator
Drew Echols, Jaemor Farms, Alto, GA
- 2:05 p.m. Using New Media To Promote Your Market
Scott Cagle, Agri-Tour Solutions, Canton, GA
- 2:35 p.m. SC Roadside Market Operator
Jeff Wilson, The Market at Cotton Hills Farm, Lowrys, SC
- 3:00 p.m. BREAK
- 3:15 p.m. Georgia Certified Farm Market Operator
Jake Carter, Southern Belle Farms, McDonough, GA
- 3:45 p.m. SC Roadside Market Operator
Brock White, Boone Hall Plantation, Mount Pleasant, SC
- 4:05 p.m. Value Added Session
Noah Ranells, Ag Economic Development Coordinator, Orange County, NC
- 4:35 p.m. Questions
- 5:00 - 6:30 p.m. WELCOME RECEPTION - TRADE SHOW AREA (Open to all registered attendees)
- Evening DINNER ON YOUR OWN

Please review other Conference Agendas for additional educational sessions, trade show events, spouse activities and entertainment opportunities during the Saturday and Sunday programs that you don't want to miss.

Strawberry Conference

All activities at the Savannah International Trade and Convention Center (SITCC) unless otherwise noted.

THURSDAY, JANUARY 7, 2010

- 8:00 - 5:00 p.m. EXHIBITOR REGISTRATION OPEN - Riverview Concourse
Exhibitor Set-Up and Poster Set-Up
- 1:30 p.m. GJVGA BOARD OF DIRECTORS MEETING
Jasper Board Room
- 4:00 p.m. GJVGA ANNUAL MEETING
Room 205

FRIDAY, JANUARY 8, 2010

- 7:00 - 5:00 p.m. ATTENDEE REGISTRATION OPEN
Riverview Concourse
- 7:00 - 10:00 a.m. EXHIBITOR MOVE IN
Exhibitors must be in place by 9:00 a.m.
- 10:00 - 6:00 p.m. TRADE SHOW OPEN
- 11:00 - 12:00 p.m. PRODUCT RECALL CRISIS
MANAGEMENT FORUM - Auditorium
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Friday Only Registrants)
- 1:30 - 4:45 p.m. ROADSIDE MARKETS
Please see page 31
- 5:00 - 6:30 p.m. WELCOME RECEPTION - TRADE SHOW
AREA (Open to all registered attendees)
- Evening DINNER ON YOUR OWN

SATURDAY, JANUARY 9, 2010

- 8:30 - 2:30 p.m. REGISTRATION OPEN
Riverview Concourse
- 9:00 a.m. GENERAL SESSION - Auditorium
- 10:30 - 2:00 p.m. TRADE SHOW OPEN
- 12:00 - 1:30 p.m. LUNCH in the Trade Show
(Lunch provided for Three Day and Saturday Only Registrants)
- 1:15 - 3:15 p.m. EDUCATIONAL SESSIONS - Room 204
Dr. Powell Smith, Extension Associate, Clemson Extension Service, Lexington, SC

- 1:15 p.m. Welcome
Scott Hart, Jr., President of Georgia Strawberry Growers Association, Moultrie, GA
- 1:20 p.m. Food Safety and You-Pick Operations
Beth Bland, Food Safety Program Coordinator, Georgia Fruit and Vegetable Growers Association, LaGrange, GA
- 1:35 p.m. High Tunnels from a Grower's and Researcher's Point of View
Bob Hall, Strawberry Grower, Bush and Vine Farm, York, SC; Dr. Barclay Poling, North Carolina State University, Raleigh, NC
- 1:55 p.m. Midas as an Alternative to Methyl Bromide
Dr. Barclay Poling, North Carolina State University, Raleigh, NC
- 2:05 p.m. Spider Mite Management in Southeastern Strawberries
Dr. Powell Smith, South Carolina Strawberry Specialist, Clemson University, Lexington, SC
- 2:30 p.m. Phytophthora Crown and Fruit Rot Control
Dr. Phil Brannen, University of Georgia, Athens, GA
- 2:00 p.m. SILENT AUCTION CLOSSES
- 2:30 p.m. TRADE SHOW CLOSSES
- 3:30 - 4:30 p.m. VEGETABLE EDUCATIONAL SESSION VI - Rooms 103/104
SOIL FUMIGANTS AND ALTERNATIVES
Moderator: Mr. Tucker Price, County Extension Coordinator, Crisp County, GA
- 3:30 p.m. Everything You Ever Wanted to Know About Buffer Zones and Were Afraid to Ask
Paul Sumner, University of Georgia, Tifton, GA
- 3:45 p.m. Methods of Controlling Soil-Borne Pests of Vegetables Utilizing Non-Fumigant Pesticides
David Langston, University of Georgia, Tifton, GA
- 4:00 p.m. Methyl Bromide Alternatives Including the UGA 3-Way, Paladin (a New Fumigant) and a New Alternative in Development
Stanley Culpepper, University of Georgia, Tifton, GA; Richard Keigwin, Director of Pesticide Re-evaluation Division of USEPA, Washington, DC
- 6:00 p.m. RECEPTION sponsored by Syngenta - Westin Savannah Harbor (open to all attendees)
- Evening DINNER ON YOUR OWN

Value of Conference – 2006-2010 Attendee Response

Attachment #3

HOME PAGE

NEWS AND ISSUES

Attachment 4

GFVGA MEMBERS MAP

GFVGA Members Map

Blueberry Blackberry Growers

EA&RP

Transportation Program

3rd Party Pesticides

Food Safety Program

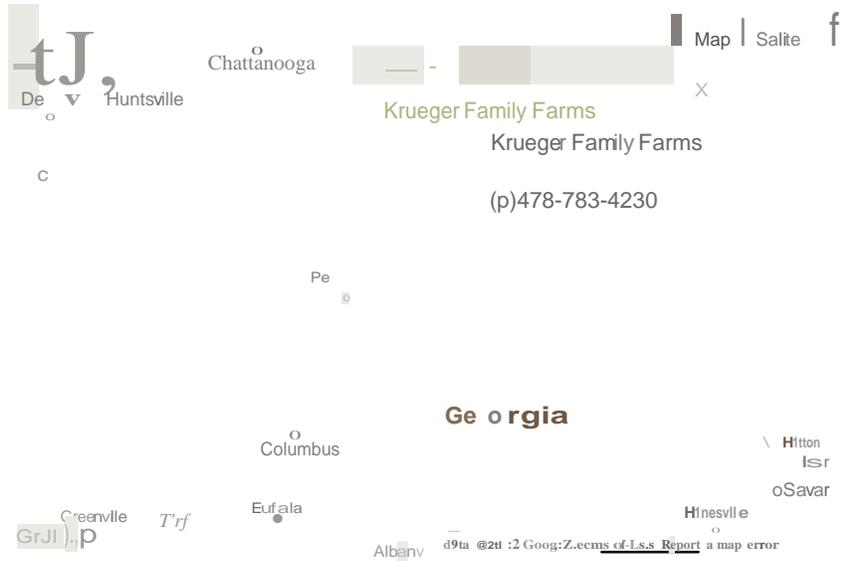
Marketing Program

Loads for Leadership

Donnie H Morris Award

Foundation Scholarship

Crisis Management



Evaluation Of The Efficacy of Chlorine Gas Seed Treatment against Bacterial leaf Spot of Pepper

David Langston, Bhabesh Dutta, Hunt Sanders, and Ron Gitaitis

Department of Plant Pathology, University of Georgia - Tifton Campus, Tifton, GA.

Justification: Bacterial leaf spot (BLS) is one of the most important bacterial diseases in pepper that has potential to cause economic losses up to 100% under favorable environmental conditions. The causal organism is a bacterium called, *Xanthomonas campestris* pv. *vesicatoria*. Infested seed is the most important primary source of inoculum for BLS. Once the pathogen is introduced via infested seed into transplant houses, high humidity, high temperature, and overhead irrigation increase the risk of BLS epidemic development. Hence, strategies to exclude the bacterium from seeds and transplants are critical for minimizing the threat of BLS. The bacterium is seed borne and can survive in association with seed, both externally and internally. The risk of bacterial transmission on the seed surface can be reduced by treating seed with sodium or calcium hypochlorite or trisodium phosphate (TSP). However, bacteria that may be carried internally are more difficult to exclude. Chemical or heat treatments that kill the pathogen within the seed also can injure or kill the seed. Hence, more effective seed treatments should be explored that can completely eradicate the bacterium from the seed without affecting seed germination.

Approach: In this proposed research, we will evaluate the efficacy of chlorine-gas seed treatment for the disinfestation of bacterial-contaminated pepper seeds. To accomplish this, the research will be separated into two phases. In the first phase, we will establish an optimum chlorine concentration and exposure duration to remove the bacterium without lowering the germination below an acceptable limit (75%). In the second phase, we will treat artificially- and naturally-infested pepper seeds with the bacterium and will compare its efficacy with commonly used seed treatments.

For the first phase, infested seeds (artificially and naturally infested) will be exposed to different concentration of chlorine gas (300, 400, 600, 800, 900, and 1200 parts per million) for different durations (3, 6, 9, 12, 18 h) in a specially designed gas chamber. Non-treated seeds will serve as a control. Treated seeds will be evaluated using a seedling grow-out assay either in the greenhouse or in germination boxes. Percent disease and percent germination for each concentration-duration combination will be recorded and compared with the non-treated control. Additionally, the presence or absence of the bacterium will be confirmed by crushing sub-sets of treated seeds in a buffer and spread-plating 100 μ l aliquots on the semi-selective medium. The chlorine concentration-exposure duration combination that will provide best seed disinfestation without affecting seed germination will be used in-phase two of this project. In the phase two, artificially and naturally infested seedlots will be treated with the best concentration-duration combination from phase one. In addition, seedlots will also be treated with 1% sodium

hypochlorite that will serve as a comparison for a commonly used seed treatment for pepper seeds against this bacterium. Treated seeds will be evaluated by seedling grow-out and plating on semi-selective agar plates as described above.

Significance: Bacterial leaf spot of pepper is a devastating disease that causes millions of dollars in losses each year in Georgia. The bacterium is both externally and internally seedborne and hence, its complete exclusion from the seed is difficult to achieve. In our earlier studies, we were able to eradicate the bacterium (*Acidovorax citrulli*) that causes fruit blotch of watermelon using chlorine gas seed treatment. In watermelon seed, this bacterium was localized internally. Using this as our supporting premise, we will develop a chlorine gas seed treatment for pepper seeds against BLS-bacterium. If successful, complete exclusion of the bacterium from pepper seed will greatly reduce the chances of BLS outbreaks in the greenhouse. This may result in saving pepper growers from incurring huge economic losses.

Advantages of chlorine gas treatment: Chlorine gas can penetrate deep into the seed killing internal seedborne inoculum without affecting seed germination. In contrast, commonly used seed treatments can decontaminate inoculum on the seed surface. Chlorine gas treatment can be used to decontaminate dry seeds and thus can be stored without the threat of fungal contamination.

An Evaluation of Direct and Indirect Economic Losses Incurred by Georgia Fruit and Vegetable Producers in Spring 2011 - A Preliminary Data Analysis and Summary Working Paper

John C. McKissick and Sharon P. Kane

Distinguished Professor of Agricultural Marketing Emeritus and Public Service Associate

The University of Georgia Center for Agribusiness and Economic Development

Introduction

During the spring of 2011, numerous agricultural businesses in Georgia reported labor shortages. A survey conducted by the Georgia Department of Agriculture reported a shortage of more than 11,000 jobs during this time period. The situation appeared most acute in those perishable fresh fruit and vegetable crops just reaching harvest in spring to early summer. These crops are most dependent on timely seasonal harvest and packing labor in order to market perishable, high valued products. This report provides a preliminary summary and analysis of the magnitude and economic impact actually reported by producers of seven primary Georgia berry and vegetable crops. The Georgia Blueberry, Blackberry, Vidalia onion, Bell Pepper, Squash, Cucumber and Watermelon crops accounted for more than \$578 million dollars of production value in 2009. This report summarizes a comprehensive survey conducted by the Georgia Fruit and Vegetable Growers Association (GFVGA) in the summer of 2011 to ascertain the magnitude and economic consequence actually experienced during the spring crop growing season. The authors utilize the data and provide analysis of the reported losses incurred directly by growers and the resulting impacts in the community and state as a result of the spring labor situation.

Survey Response

A survey instrument was developed by the GFVGA in consultation with major agricultural organizations, commodity leadership and UGA Agricultural economists. The GFVGA survey was made available via electronic and hardcopy survey instrument to Georgia growers of the seven primary crops during August 2011. Follow up interviews were conducted for incomplete surveys by GFVGA staff. All raw data collected absent any respondent identification was provided to economists at the UGA Center for Agribusiness and Economic development for analysis and summary. As the following table shows, significant amounts of the total estimated acreage as reported in the UGA 2009 Farm Gate Value Report of the 7 crops were represented in the survey response. 189 respondents representing an aggregate of 31,311 acres of the 67,513 acres or 46.4% of the total Georgia production acreage completed and submitted surveys. Of the total responses, 41 of the respondents, representing 19.7% of the survey production acreage and 9.1% of Georgia's 2009 acreage, responded they did not experience harvest/packing labor shortages. 148 survey respondents reported they had experienced labor shortage, representing 80.3% of the survey production acreage and 37.3% of Georgia's 2009 acreage. It is apparent that a significant number of Georgia's spring Berry and Vegetable producers experienced labor shortages in the spring of 2011.

Table 1. Summary Survey Table with Estimated Acreage by Each Crop and Totals

		Total	No labor problem	Yes labor problem	Answered Labor Production Question
CROP		#/Acres/%	#/Acres/%	#/Acres/%	#/Acres/%
Blueberries	Survey Completed	92	27	65	54
	Total acres (2009)	16,346			
	Total Acres in survey	7,659	1950	5709	5192
	% of total acres in survey	46.9%	11.9%	34.9%	31.8%
Blackberry	Survey Completed	13	4	9	9
	Total acres (2009)	630			
	Total Acres in survey	502	120	382	382
	% of total acres in survey	79.7%	19.0%	60.6%	60.6%
Vidalia Onion	Survey Completed	18	*	*	15
	Total acres (2009)	12,993			
	Total Acres in survey	9,033	1985	7048	6223
	% of total acres in survey	69.5%	15.3%	54.2%	47.9%
Bell Pepper	Survey Completed	20	*	*	17
	Total acres (2009)*	5,130			
	Total Acres in survey	2,552	50	2502	2312
	% of total acres in survey	49.7%	1.0%	48.8%	45.1%
	Spr - 5,130 A				
	Fall - 3,420 A				
Squash	Survey Completed	14	*	*	10
	Total acres (2009)*	2,922			
	Total Acres in survey	1,515	190	1325	970
	% of total acres in survey	51.8%	6.5%	45.3%	33.2%
	Spr – 2,922 A				
Fall – 1,948 A					
Cucumber	Survey Completed	12	0	12	9
	Total acres (2009)*	5,254			
	Total Acres in survey	2,510	0	2510	2100
	% of total acres in survey	47.8%	0.0%	47.8%	40.0%
	Spr – 5,254 A				
Fall -3,502 A					
Watermelon	Survey Completed	20	6	14	12
	Total acres (2009)	24,238			
	Total Acres in survey	7,540	1860	5680	5645
	% of total acres in survey	31.1%	7.7%	23.4%	23.3%
GRAND TOTAL	Survey Completed	189	41	148	126
	Total acres (2009)	67,513			
	Total Acres in survey	31,311	6155	25156	22824
	Percent survey of total acres	46.4%	9.1%	37.3%	33.8%
	Percent of survey acres	100.00%	19.66%	80.34%	72.89%
	Percent of survey responses	100.00%	21.69%	78.31%	66.67%

*Undisclosed category due to 2 or fewer responses.

Economic Consequences

Utilizing the detailed historical and 2011 production and cost data supplied by the survey respondents, the authors calculated production losses or gains incurred by the survey respondents and those attributed to labor for the seven spring crops. Multiple questions allowed for consistency checks across the data as did the historical yield and price data. Loss calculations were derived from expected yield and price questions and compared to actual production realized from the acreage available for harvest. Questions pertaining to the amount of production unharvested or acreage that went unharvested allowed for calculated losses attributed directly to harvest/packing labor shortfalls. In addition, the total number of harvester and/or packing jobs during peak harvest as compared to normal peak harvest employment allowed for calculation of total employment shortfalls. The following table summarizes the calculated losses by crop.

Table 2. Calculated Survey Loss Summary by Crop

	Calculated Production Losses Related to Labor Shortage -\$-	Peak Harvest Labor Shortage Reported - # jobs-
Blueberries	-29,051,947	-1,932
Blackberries	-4,027,125	-300
Total for Berries	-33,079,072	-2,232
Watermelon	-2,592,230	-305
Cucumbers	-5,932,600	-806
Bell Peppers	-15,115,645	-948
Squash	-1,948,629	-118
Onions	-16,312,345	-835
Total for Vegetables	-41,901,449	-3,012
Overall Total	-74,980,521	-5,244

According to the information derived only from the survey respondents, producers who completed production or labor loss estimates directly attributable to harvest and packing labor shortages had a total calculated vegetable loss of \$41.9 million and berry loss of \$33.1 million for a total of \$75 million in the seven spring crops. If the survey respondents are representative of non-respondents, the total loss attributed to labor in the seven crops would be about \$140 million based on loss per acre per crop as the total response represents 46.4 percentage of the total estimated crop acreage in the seven crops. The survey respondents reported a shortage of 5,244 workers at peak harvest season or 40.5 % of their normal peak harvest employment of 12,930 workers.

Economic Impact on Georgia and Local Communities

Lost fruit and vegetable production in the state in 2011 resulted in losses not only to the producers involved but to input suppliers to the producers as well as those who benefit indirectly from the expenditures that would have been created in the state and local communities. A multi county and state model of all the business and interactions of consumers and business was formulated to estimate the impacts of the reported losses experienced by the seven spring crops in Georgia. Results indicated that on an annual basis the \$41.9 million in lost vegetable production due to labor shortages resulted in another \$56.1 million dollars lost in other goods and services in Georgia's economy for a total economic impact of about \$98 million. The total of \$33.1 million in berry production lost due to inadequate labor resulted in another \$50.4 million for a total impact of \$83.5 million. The total Georgia vegetable and berry economic impacts calculated from the labor related lost production reported in the survey were estimated to be over \$181 million less in total goods and services produced.

The so-called multiplier impacts occur as the money normally generated from the fruit and vegetable production was not spent on purchasing other goods and services. For instance, not only would the input suppliers suffer lost sales, but so would all the retail businesses that would have had customers from those employed by the fruit and vegetable producers and suppliers. The impacts reach further into the economy as the retailers then ultimately purchase less from others. On and on the impacts spin through the state and region's economy, resulting in fewer goods and services or state output produced in a multitude of industries and business not directly associated with fruit and vegetable production.

The lost output results in fewer jobs in producing not only the fruit and vegetables, but in those supplying other inputs that are no longer needed and the businesses selling products to the workers. The total job loss in a full time annual equivalent job basis was found to be 572 jobs lost directly in the production and another 940 in related businesses. Thus, the total impact resulting from the labor related lost production as reported from the survey respondents would be the loss of 1,512 full time jobs in Georgia per year. These results should be interpreted to mean that over a full production year, the impacts of the reported lost production in the survey would have the calculated impacts on Georgia's economy.

Table 3. Estimated Full Year Economic Impacts of Lost Labor Related Berry and Vegetable Production, Survey Response Only, Spring 2011

Impact and Area	Value of Output per Year (\$)			Full time Jobs Per Year (#)		
	Direct	Indirect	Total	Direct	Indirect	Total
Berries Statewide	-\$33,079,072	-\$50,425,012	-\$83,504,084	-270	-452	-722
Vegetables Statewide	-\$41,901,449	-\$56,099,859	-\$98,001,308	-302	-488	-790
Total Berry & Veg Statewide	-\$74,980,521	-\$106,524,871	-\$181,505,392	-572	-940	-1,512
Berry Production Counties	-\$33,079,072	-\$34,802,037	-\$67,881,109	-243.3	-374.9	-618
Vegetable Prod. Counties	-\$41,901,449	-\$35,502,846	-\$77,404,295	-284.4	-379.4	-664
Total Berry & Veg Prod. Area	-\$74,980,521	-\$70,304,883	-\$145,285,404	-528	-754	-1,282

Berry counties SE Ga., 4 Vegetable Crops SW Ga. Plus Onions SE Ga.= Veg. County Area
Lost Production Related to Labor, GFVGA Survey of 7 Spring Fruit and Vegetable Crops

The multiplier impacts are also keenly felt on the local level. The production counties for all the vegetables crops, with the exception of onions, are in the Southwest counties of the state. Berry and Onion production are in the Southeast part of the state. In order to illustrate the impacts on the local counties of production, regional models of Southwest and Southeast Georgia counties were estimated to illustrate the community impacts. As can be seen from the table, the local communities suffer most of the impact with all the direct impact occurring locally with an additional \$70.3 million occurring in indirect effects for a total community impact of over \$145 million. In full time annual equivalent job units, the direct impact to the local community is a reduction of 528 full time jobs per year. An additional 754 in related jobs are lost due to reduced output and thus fewer jobs generated. The total impact in job loss is found to be about 1,282 fewer jobs in the local production area as a result of the lost output reported by producers in spring 2011 due to the labor situation.

The results in all the impact tables are based only on the results found directly from the survey. If the survey were representative of all of Georgia's seven crop's acreage studied, then the results from the impact analysis could be scaled to reflect the overall impact of the approximately 53.6% of Georgia acreage not accounted for in the survey. The impact tables show that for each \$1 million lost in berry production there is an additional \$1.4 million of lost output and about 20 loss jobs. Each \$1 million in vegetables results in an additional indirect impact of \$1.34 million and the loss of about 19 total full time jobs. For example, If the survey results were representative of all acreage, the total yearly impact would be about \$391 million and the job loss would be about 3,260 on a statewide basis. However, no data exist to determine how representative the surveyed acreage is of the total acreage. The survey does represent a detailed analysis of a very large percentage of the seven berry and vegetable crops.

Since the labor shortage became apparent to producers after production plans and pre harvest inputs were purchased and used, a second model was estimated to account for the total impacts of the post-harvest/packing inputs alone. The loss output reported from the survey was reduced by the ratio of pre harvest to post harvest expenses and resulted in a total economic impact of -\$103.6 million on a state level with -\$83.2 million occurring in the local production communities. Job losses were calculated at 869 full time jobs on the state level with a loss of 739 full times jobs occurring at the local level. This model can be interpreted to represent an approximation of the economic impacts occurring in the partial production year of 2011 as production input were purchased in anticipation of a complete harvest. The growers experienced a reported loss from inadequate harvest and packing labor of \$75 million in spring 2011 in the seven crops, but the total economic impacts were mitigated as inputs were purchased for a full harvest. However, if the results are repeated in following full years, the impacts of the full production year model would be felt.

Table 4. Estimated Partial Production Year Economic Impacts of Lost Labor Related Berry and Vegetable Production, Survey Response Only Spring 2011

Impact and Area	Partial Year Value of Output (\$)			Full time Jobs Per Year (#)		
	Direct Impact Net of Pre-Harvest Inputs	Indirect Impacts	Total	Direct	Indirect	Total
Berries Statewide	-\$22,861,808	-\$34,850,038	-\$57,711,846	-187	-312	-499
Vegetables Statewide	-\$19,625,942	-\$26,276,243	-\$45,902,185	-142	-228	-370
Total Berry & Veg Statewide	-\$42,487,750	-\$61,126,281	- \$103,614,031	-328	-541	-869
Berry Production Counties	-\$22,861,808	-\$24,052,595	-\$46,914,403	-168.2	-259.1	-427
Vegetable Prod. Counties	-\$19,625,942	-\$16,663,650	-\$36,289,593	-133.6	-177.9	-312
Total Berry & Veg Prod. Area	-\$42,487,750	-\$40,716,245	-\$83,203,996	-302	-437	-739

Berry counties SE Ga., 4 Vegetable Crops SW Ga. Plus Onions SE Ga.= Veg. County Area
 Partial Year Output assumed from the reported Labor Related Production Loss Adjusted by Crops Pre Harvest to Post Harvest Expense Ratio

In an effort to determine what the longer term or full year impacts may be, the survey asked how producer's 2012 production may be impacted by the labor situation experienced in 2011. The table below shows that while most respondents to the question indicated they would try to maintain production, a significant number of vegetable producers planned cuts. Yearly planted annual crops such as vegetables can more easily be altered than can perennial, multi-year crops such as those produced from berry bushes. However, even berry producers indicated planned changes in production and harvest/packing methods if the labor experience of 2011 is likely repeated in 2012.

Table 5. Summary of 2012 Intentions by Crop

CROP	Total Number Reporting Labor Problems	Response to Q	Plans for spring 2012 – Acres			Avg % decrease
			Increase	Maintain	Decrease	
Blueberries	65	36	6	26	4	35%
Blackberries	9	5	0	1	4	57%
Total Berries	74	41	6	27	8	47%
Percent of Berry Growers Reporting Labor Problem		55%	15%	65%	20%	
Bell Pepper	19	13	1	7	5	55%
Cucumbers	12	8	0	4	4	35%
Squash	12	8	0	5	3	30%
Vidalia Onions	17	13	0	5	8	40%
Watermelons	14	5	0	0	5	35%
Total Vegetables	148	47	1	21	25	39%
Percent of Vegetable Growers who Reported Labor Problem		72%	2%	45%	53%	
Total Berry and Veg.		88	7	48	33	
Percent			8%	54.5%	37.5%	

**Georgia Commodity Commission for Vegetables
Emergency Research Fund - Report**

Georgia trapping activities for the European pepper moth *Duponchelia fovealis* Zeller, October 2011 to September 2012

David Riley, University of Georgia Vegetable Entomologist

Introduction

The European pepper moth (EPM), *Duponchelia fovealis* (Figure 1), is a new invasive Lepidopteran pest of vegetables (peppers) and greenhouse ornamental crops in Georgia. It was first detected near Savannah Georgia by USDA APHIS PPQ in October 2010, and was surveyed in the Georgia to determine its distribution and importance to date. The larvae (Figure 1) cause damage to the pepper plant by boring into the stem and fruit, typically in the top two centimeters of soil, causing the host plant to wilt. In Lantana it feeds on lower leaves and returns back into the soil media during the day, so they are difficult to detect. The adults of this pest had already been detected in pheromone traps across the state of Florida, as far north as Jacksonville by September 2011 when the southern Georgia survey was initiated.

Survey Method

A total of 29 counties in Georgia were surveyed with EPM pheromone traps to assess the distribution of this new pest. In addition, 7 southern Georgia counties were surveyed twice monthly for one whole year to determine the population dynamics of this pest and try to assess if population were increasing over time, suggesting greater establishment. The seven counties in southern Georgia were where a majority of pepper is grown in the State. Since this region was sampled a year after the 19 northern counties surveyed by USDA APHIS in 2010, the county trap numbers are biased toward the south, assuming increased EPM from 2010 to 2012 (Figure 3). At each site, delta-wing type traps were baited with one rubber septa containing a pheromone lure specific to *D. fovealis* which was changed bimonthly, and suspended within the perimeter of high-risk vegetable or nursery plant production areas. Traps were placed in open areas with good air-flow at approximately two meters in height. Except in the greenhouse nursery study where traps were place within plastic covered Lantana plant houses. The purpose of this additional survey was to assess the effectiveness of current typical soil insecticide treatments used for general insect control that might also control EPM. The specimens observed

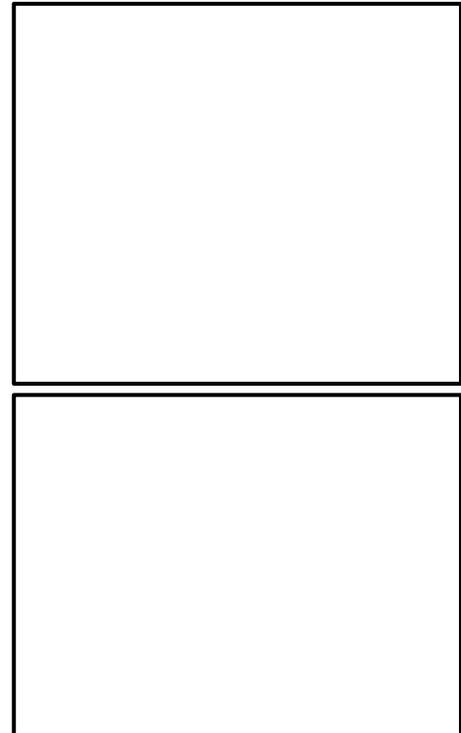


Figure 1. European pepper moth (above) and larva (below) content from Derksen and Whilby (2011)

in the trap were collected and submitted to FDACS-DPI in Gainesville, Florida for identification verification and are currently stored at UGA Tifton Campus frozen as vouchers.

The EPM pheromone traps which were positive for EPM captures in the 2010-2012 survey occurred in Brooks, Chatham, Clayton, Colquitt, Fayette, Grady, Lowndes, Oconee, Rockdale, Thomas, and Tift Counties by USDA APHIS and the UGA Vegetable Entomology Laboratory. By October 2012, my lab had detected extremely high levels of EPM in Grady County, Georgia where a year total of 506 moths had been collected (most southern light green colored county in the adjacent map). Colquitt County was a far second with 67 moths captured followed by 26 moths in Tift and 16 moths in Lowndes, respectively. Since the northern survey was not conducted after September 2011, we do not know if those counties with EPM moth captures would have attained as high numbers, but based on the southern survey, it was possible. We suspected that the location of a very large plant nursery (Figure 2) which was experiencing problems with EPM in their greenhouses in Grady County might explain the high EPM number in that county. What the high number in these counties did allow was a good measure of the populations dynamics of this pest in Georgia, i.e., how the numbers of moths might be expected to increase and decline as the plant production season progresses (Figure 3). Also, the infestation in *Monrovia lantana* greenhouses offered a unique opportunity to investigate insecticide efficacy for this new pest. What was observed during the course of this survey was that field damage to pepper was not apparent even at heavily infested EPM sites.

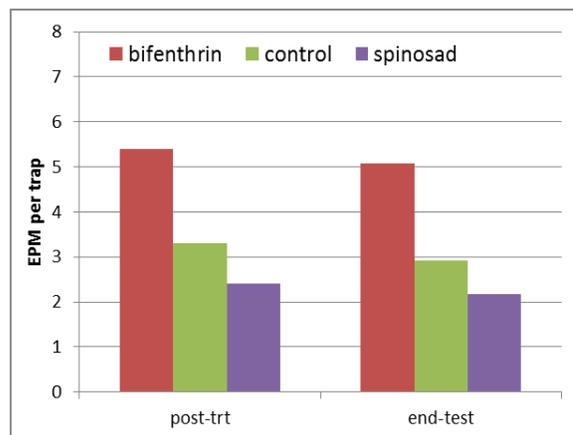


Figure 2. EPM distribution map in Georgia (above) and Monrovia Nursery in Grady County (below) with EPM detected in 2012.

The population dynamics of EPM pictured in the graph below (Figure 3) clearly shows a trend down after an initial peak in October 2011 followed by an oscillating increase throughout 2012 to a peak at the final sample date on October 2012. Thus, overall numbers are increasing over time. Another trend was that in the 7 counties surveyed for these data we picked up two new positive counties over the course of one year, suggesting some spread in distribution of EPM had occurred. It appears that EPM is a new invasive insect pest that is establishing itself in Georgia. At the current time, it appears to be a more serious insect pest for the potted plant industry than for field vegetable crops, but, fortunately, does not appear to be a key pest in either at this time.

Figure 3. European Pepper Moth trap capture rates across 7 Georgia counties from September 2011 to October 2012.

The EPM infestation at the Monrovia Plant Nursery afforded a quick evaluation of standard potting media treatment for the control of soil inhabiting insect pests against EPM whose larvae stay in the soil media during the daylight hours. The test required the use of nine greenhouses in order to compare 3 replicates of an untreated greenhouse to sprayed houses with the following treatments of bifenthrin or Talstar @ 16 oz/100 gallons and spinosad or Conserve @ 6 oz/100 gallons. The results indicated bifenthrin aggravates EPM populations, i.e. makes them worse, while spinosad tends to control EPM (see graph).



1 **Appendix 2** – Project 16. INCREASING COMPETITIVENESS OF GEORGIA’S

2 CUT FLOWER INDUSTRY – UNIVERSITY OF GEORGIA

3 Abraham et al: Pesticide compatibility with
4 greenhouse biocontrol

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7 Journal of Economic Entomology

8 Biological and Microbial Control

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11 **Pesticide Compatibility with Natural Enemies for Pest Management in Greenhouse**

12 **Gerbera Daisies**

13

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25 **Abstract** We studied the compatibility of various pesticides used in commercial
26 greenhouse management with two biological control agents; a leafminer parasitoid
27 (*Diglyphus isaea* (Walker)), and a predatory mite (*Neoseiulus californicus* (McGregor)).
28 These natural enemies were exposed to miticides, fungicides, and insecticides used
29 against leafminers, thrips and whiteflies according to label directions in laboratory vial
30 assays, after which mortality at 12, 24, and 48 hours (h) was recorded. Greater mortality
31 of predatory mites than leafminer parasitoids was observed overall, illustrating that fewer
32 pesticides were compatible with predatory mites compared with the parasitoid. However,
33 some commonly used pesticides were found to cause high mortality to both the leafminer
34 parasitoid and predatory mites. Twospotted spider mite (*Tetranychus urticae* Koch)
35 infestations often disrupt leafminer (*Liriomyza trifolii* (Burgess)) biocontrol programs.
36 Therefore, potentially compatible miticides (bifenazate, hexythiazox, spiromesifen,
37 acequinocyl, etoxazole, and clofentezine) identified in laboratory trials were also
38 evaluated in a greenhouse study to determine if they were compatible with leafminer
39 parasitism during a 4 week period. All six of them were compatible with leafminer
40 biocontrol and did not affect parasitoid survivability in the long run.

41 **KEYWORDS** *Diglyphus isaea*, Greenhouse pest management, Greenhouse biocontrol,
42 Leafminer biocontrol, Safe pesticide.

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46 The primary pests affecting greenhouse gerberas are serpentine leafminers,
47 *Liriomyza trifolii* (Diptera: Agromyzidae), which have a wide distribution and attack
48 more than 400 species (Reitz and Trumble 2002) of plants including vegetables and
49 ornamentals. The larvae feed on the palisade mesophyll (Parrella et al. 1985) and
50 decrease photosynthesis and yield, directly affecting the marketable produce. Intensive
51 and extended use of pesticides has rendered leafminers resistant to almost all chemistries
52 (Keil and Parrella 1982). Leafminers are also protected from pesticides by being
53 concealed within the leaves in their larval stages. Successful biocontrol has been
54 implemented by augmentative releases of parasitoids. This has however been effective in
55 areas only where disruptive use of chemical controls has been avoided (Liu et al. 2009).

56 The influx of secondary pests like mites, thrips, whiteflies, and aphids, and
57 pathogens causing powdery mildew through the season necessitates pesticide sprays that
58 in turn kill the leafminer parasitoids and disrupt biocontrol. The unique situation in
59 greenhouse gerbera production suggests the potential for integrated pest management
60 (IPM) as an effective solution. While pesticides work against secondary pests, they also
61 disrupt biological control of the primary pest. Knowing which chemicals can be used
62 against secondary pests without harming the natural enemies of primary or secondary
63 pests would facilitate implementation of an integrated pest management (IPM) program
64 for greenhouse gerberas. While there is information about compatibility of pesticides to
65 several parasitoids in numerous production systems (Biobest, Koppert), gaps exist in the
66 greenhouse gerbera system regarding commonly used pesticides and the natural enemies
67 that have potential.

68

69

Materials and Methods

70 We evaluated the compatibility of commonly used pesticides in greenhouse
71 gerberas with 2 natural enemies: a leafminer parasitoid (*Diglyphus isaea*), a wasp that
72 feeds on the immature leafminer as part of its life cycle, and a predatory mite (*Neoseiulus*
73 *californicus*), a mite that is predaceous on pest mite species (Rincon- Vitova Insectaries,
74 Ventura, CA). There are at least 6 major pests that are targeted in greenhouse gerbera
75 management: leafminers (*Liriomyza trifolii*), mites (*Tetranychus urticae*), thrips
76 (*Frankliniella occidentalis*), whiteflies (*Trialeurodes vaporariorum*, and *Bemisia tabaci*),
77 aphids (*Myzus persicae*), and pathogens causing powdery mildew (from the genera
78 *Podosphaera*, *Erysiphe*, *Leveillula*, *Golovinomyces*, and *Oidium*). Thus at least 5 groups
79 of pesticides (Table 1) need to be evaluated, because aphids are often targeted by the
80 same insecticides but at a lower rate than when used against pests like whiteflies or
81 leafminers. Following a laboratory study in which the toxicity of these chemicals within
82 48 h was documented, pesticides that caused the least mortality from among the
83 treatments in the miticide group were used in a greenhouse study to investigate the
84 toxicity post 48 h.

85 Laboratory Study

86 **Experimental Protocol.** Pesticides (Table 1) selected for the lab assays are commonly
87 used in greenhouse management. Nine pesticides and a water control were evaluated.
88 Since pesticides recommended against aphids are also used against other pests but at a
89 higher rate, they were not evaluated as a separate group. Previously documented vial
90 assay methods (Bjorksten and Robinson 2005, Wu and Miyata 2005) were modified and

91 employed as leaf dip assays for the parasitoid wasps, and as pesticide swirl assays for
92 predatory mites.

93 Leafminer parasitoid (*D. isaea*): Gerbera plugs that had not previously been treated were
94 obtained from Speedling Inc., Blairsville, GA. A single leaf was removed from the plug
95 and covered with cotton around the petiole and inserted into one end of a 1.5 cm long
96 section of Tygon® tubing and hydrated using a squirt bottle when necessary. The leaf
97 was then completely dipped in the respective treatments (aqueous pesticide solutions at
98 label rates or water control) for 10 seconds each and allowed to dry for at least 3 h. After
99 the inside of the vial was streaked with honey (as a food source for the parasitoids), 10 *D.*
100 *isaea* parasitoids were introduced. The tubing with the leaf inside was then inserted at
101 the neck region of the vial and sealed using Parafilm™.

102 Predatory Mites (*N. californicus*): A solution (10-15 ml) of the designated treatment was
103 poured into each glass vial and swirled for even coverage over the surface of the glass.
104 After allowing at least 3 h for drying, a drop of honey was streaked inside each vial, and
105 then 10 adult *N. californicus* mites were inserted and the vial capped.

106 ***Design and Data Collection.*** Five experiments where an experimental unit was a vial
107 were conducted, and the experiment consisted of 10 replicates for each of the 10
108 treatments, all of which were placed on a lab counter with a 14 h light: 10 h dark period
109 and held at 22-25°C. Each experiment was repeated on 2 other days for a total of 15
110 trials. Live adult parasitoids and adult mites (viewed through a microscope) were
111 counted 12, 24, and 48 h after the treatment. Any movement by the natural enemy

112 designated them as alive while the lack of movement when disturbed resulted in counting
113 them as dead.

114 **Greenhouse Miticide Study**

115 ***Location and Experimental design.*** The study was conducted at the UGA-Griffin
116 campus. After selecting and housing 170 potted gerbera plants of the Gerbera ‘Festival
117 Mini Yellow Shade’ cultivar in similar growth stages, an excess of 500 adult *L. trifolii*
118 collected from grower and research greenhouses were released into the greenhouse.
119 Treatments included 6 miticides (bifenazate, hexythiazox, spiromesifen, acequinocyl,
120 etoxazole, and clofentezine) and a (water) control and were applied a week after the flies
121 were introduced. Each cage (BugDorm rearing cage, # 1452, BioQuip Products, Rancho
122 Dominguez, CA) was an experimental unit and housed 4 potted plants for a total of 168
123 plants in 42 cages. Twenty-four hours later, 10-12 parasitoids (*D. isaea*) purchased from
124 Rincon Vitova Insectaries Inc., Ventura, CA, were released into each cage. During the
125 test period, the greenhouse was maintained at 25-32°C and 85% humidity.

126 ***Data Collection and Evaluation.*** Seven days after the parasitoids were released, 3 leaves
127 were sampled from each experimental unit and inspected under a microscope for
128 parasitoid and leafminer activity. After the first sampling date, cages were removed so
129 that the leafminer pressure and the parasitoid availability would be equal for all the
130 plants, while residual toxicity would determine the actual activity of leafminer and *D.*
131 *isaea*. The greenhouse was flooded with an excess of 600 adult leafminers and 72 h later,
132 250 parasitoids. Sampling was then repeated every seventh day thereafter for three weeks
133 spanning 14 June through 5 July, 2011.

134 **Statistical Analyses**

135 The experiments were analyzed as randomized complete block designs.
136 Replications were considered as the block factor. Data were subjected to analysis of
137 variance (ANOVA) using the general linear model procedure (PROC GLM, SAS
138 Institute 2003) and means were separated using Tukey's HSD test.

139 **Laboratory Study.** Treatment means were analyzed separately for each study. When
140 initial analysis determined that date was significant ($P < 0.05$), trials for each experiment
141 were subsequently analyzed separately. The tiered method advocated by IOBC
142 (International Organization of Biological Control) considers pesticides from lab studies
143 causing mortality rates of 30-79% to be slightly harmful and $< 30\%$ mortality harmless
144 (Stark et al. 2007), and chemicals falling in both these categories to qualify to be part of
145 IPM programs. Pesticides in this study that caused mortalities within these values at least
146 twice out of the three trials were considered at least "less harmful".

147 **Greenhouse Study.** Data were analyzed as above, first to find the difference in parasitism
148 rate (average number of parasitoids/ total number of leafminers in the experimental unit)
149 between the treatments. Additional analyses investigated the differences based on
150 average number of leafminers, average number of parasitoids, number of live leafminers,
151 and total (sum of live and dead) leafminers.

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155

Results

156 **Laboratory study**

157 Following the criteria accepted by IOBC (Stark et al. 2007), chemicals tested in
158 laboratories are divided into four categories based on their toxicity. Those causing <
159 30% mortality are considered harmless, 30-79% slightly harmful, 80-98% moderately
160 harmful, and > 99% considered harmful. The same criteria were used to elucidate our lab
161 experiment results.

162 ***Leafminer chemicals (D. isaea at 48 h).*** Novaluron and petroleum oil were harmless
163 (<30% mortality within 48 h in at least 2 out of the 3 trials) (Table 7). Azadirachtin,
164 cyromazine, and acetamiprid were slightly harmful, causing mortality in the range of 30-
165 79%. Lambda cyhalothrin was found to be moderately harmful with a mortality of 80-
166 98%. Dinotefuran and bifenthrin were harmful and caused mortality > 99% within 48 h
167 (F range = 27.04 – 47.96; $df = 9, 99$; $P < 0.0001$) (Table 2). Though spiromesifen was
168 tested together with leafminer chemicals, it actually is not labeled for use against
169 leafminers. It was tested at the whitefly rate as an additional whitefly chemical.

170 ***Leafminer chemicals (N. californicus at 48 h).*** At the 48 h mark, none of the pesticides
171 were harmless to the predatory mites (Table 7). Cyromazine, novaluron and petroleum
172 oil were found to be slightly harmful (30-79% mortality). Azadirachtin was moderately
173 harmful, with 80-98% mortality; dinotefuran, bifenthrin, lambda cyhalothrin, and
174 acetamiprid were harmful and caused > 99% mortality in the predatory mites (F range =
175 16.84 – 46.24; $df = 9, 99$; $P < 0.0001$) (Table 2). The low mortality in the cyromazine
176 treatment and for novaluron at the 48 h mark does not ensure their harmlessness though

177 because of their being insect growth regulators (IGRs) with effects not showing up until
178 later.

179 **Miticides (D. isaea at 48 h).** Clofentazine and acequinocyl were harmless and caused <
180 30% mortality within 48 h (Table 7). Bifenazate, hexythiazox, spiromesifen, etoxazole,
181 and milbemectin were slightly harmful and caused 30-79% mortality. Abamectin caused
182 80-98% mortality and spinosad > 99%, and these were moderately harmful and harmful
183 to *D. isaea* respectively (F range = 17.46 – 84.97; df = 9, 99; P < 0.0001) (Table 3).
184 However most of the miticides that demonstrated lower mortality at the 48 h mark were
185 IGRs and only a prolonged study (Greenhouse Study detailed below) could confirm if
186 they are actually safe to *D. isaea* for a longer period.

187 **Miticides (N. californicus at 48 h).** Etoxazole, bifenazate, hexythiazox, clofentazine,
188 and spiromesifen were slightly harmful and caused 30-79% mortality (F range = 12.85 –
189 43.56; df = 9, 99; P < 0.0001) (Tables 3, 7). However, a majority of them being IGRs
190 and specifically miticides would not necessarily make them compatible with a biological
191 control program involving predatory mites unless selective toxicity to pest mite species is
192 proven. While acequinocyl caused 80-98% mortality, abamectin, spinosad and
193 milbemectin caused > 99% mortality even at the 48 h mark and therefore were harmful.

194 **Whitefly chemicals (D. isaea at 48 h).** Pyriproxyfen, and spiromesifen caused < 30%
195 mortality at the 48 h mark (F range = 20.07 – 24.71; df = 9, 99; P < 0.0001) (Tables 4, 7)
196 and therefore were considered harmless to *D. isaea*. Spirotetramat, flonicamid,
197 pyridaben, and chlorpyrifos at their respective median label rates (Table 1) were found to
198 cause 30-79% mortality. Pyriproxyfen is an IGR and caused low mortality, while

199 spirotetramat and spiromesifen are not IGRs and can be components in an IPM program.
200 Kinoprene, thiamethoxam, imidacloprid, and lambda cyhalothrin caused 80-98%
201 mortality and are probably best not used in a biological based IPM program.

202 **Whitefly chemicals (*N. californicus* at 48 h).** Flonicamid, spirotetramat, thiamethoxam,
203 and spiromesifen were slightly harmful, causing 30-79% mortality within 48 h (F range =
204 21.7 – 24.94; $df = 9, 99$; $P < 0.0001$) (Tables 4, 7). Pyriproxyfen, and chlorpyrifos
205 caused 80-98% mortality (moderately harmful), while kinoprene, imidacloprid, pyridaben
206 and lambda cyhalothrin caused > 99% mortality (harmful) in the predatory mites.

207 **Thripicides (*D. isaea* at 48 h).** Flonicamid, cyfluthrin, insecticidal soap, *Beauveria*
208 *bassiana*, and acetamiprid were found to be slightly harmful because they inflicted
209 mortality within the range of 30-79% in 48 h (F range = 31.2 – 40.96; $df = 9, 99$; $P <$
210 0.0001) (Tables 5, 7). While abamectin, fluvalinate, and chlorfenapyr caused 80-98%
211 mortality (moderately harmful) in *D. isaea*, spinosad was responsible for >99% (harmful).

212 **Thripicides (*N. californicus* at 48 h).** Flonicamid and insecticidal soap caused 30-79%
213 mortality (slightly harmful), while *B. bassiana*, and acetamiprid were moderately harmful
214 and caused 80-98% mortality (F range = 15.04 – 32.61; $df = 9, 99$; $P < 0.0001$) (Tables 5,
215 7). Abamectin, spinosad, cyfluthrin, fluvalinate, and chlorfenapyr, caused > 99%
216 mortality in the mites (harmful).

217 **Fungicides (*D. isaea* at 48 h).** All tested fungicides showed lower than 79% mortality in
218 *D. isaea* within 48 h and thus qualify to be used in IPM programs. Butanone, fosetyl-
219 aluminum, azoxystrobin, potassium bicarbonate, pyraclostrobin, copper sulfate, and
220 piperalin caused < 30% and so are considered harmless (F range = 1.53 – 4.92; $df = 9, 99$;

221 $P < 0.0001$ - 0.15) (Tables 6, 7). Rosemary oil (EcoSmart), and sulfur were the only ones
222 that caused higher mortality but still remained within 30-79% and thus are considered
223 only slightly harmful.

224 **Fungicides (*N. californicus* at 48 h).** Butanone and copper sulfate caused 30-79%
225 mortality in mites (F range = 16.11 – 70.13; $df = 9, 99$; $P < 0.0001$) (Tables 6, 7),
226 therefore slightly harmful. Sulfur was moderately harmful and caused 80-98% mortality
227 while fosetyl-aluminum, rosemary oil, azoxystrobin, potassium bicarbonate,
228 pyraclostrobin, and piperalin caused >99% mortality (harmful) in *N. californicus*.

229 While there were slight differences in individual mortality values attributed to
230 specific pesticides, the ones consistently inflicting high mortality on natural enemies were
231 clearly identified. In general, more pesticides were compatible with the parasitoids (*D.*
232 *isaea*) than the predatory mites (*N. californicus*) (Table 7). Salient points distilled from
233 the results above are given below (F range = 12 – 119; $df = 9, 99$; $P < 0.0001$).

- 234 1. Six miticides cause less mortality than the industry standard, abamectin, in the
235 parasitoid *D. isaea* even at 48 h.
- 236 2. Spinosad, a good control for thrips, caused high mortality in the parasitoid.
- 237 3. Mortality of *D. isaea* parasitoids due to the fungicides did not vary significantly from
238 the water control (F range = 1.53 – 5.5; $df = 9, 99$; P range = < 0.0001 – 0.1511), but
239 they inflicted high mortality on the predatory mites *N. californicus* (Table 6).

240 **Greenhouse Study**

241 Treatments did not differ from the control in parasitism rates over 4 weeks,
242 confirming compatibility observed in laboratory studies (F range = 0.22 – 1.38; $df = 6$,

243 41; P range = 0.2615 – 0.9673) (Appendix Table 2). The fluctuation in parasitism level
244 was not restricted to the treatments but the control also followed the same trend. There
245 was no significant difference between the treatments and control in any of the parameters
246 that were additionally tested: average number of leafminers (F range = 0.95 – 1.27; df =
247 6, 41; P range = 0.3016 – 0.4774) (Appendix Table 3), average number of parasitoids (F
248 range = 0.18 – 1.54; df = 6, 41; P range = 0.1985 – 0.9800) (Appendix Table 4), number
249 of live leafminers (F range = 0.95 – 1.27; df = 6, 41; P range = 0.3016 – 0.4774)
250 (Appendix Table 5), and total (sum of live and dead) leafminers (F range = 0.31 – 1.51;
251 df = 6, 41; P range = 0.1964 – 0.9276) (Appendix Table 6). Parasitism, which started
252 high in the first week, fell in the second week and returned to its highest level by the
253 fourth week.

254 Discussion

255 Laboratory study

256 For each of the groups of chemicals that were tested, a majority were found to be
257 toxic to the leafminer parasitoid *Diglyphus isaea* at the 48 h mark, and even more so for
258 the predatory mite *Neoseiulus californicus*. Some of those that were found to be less
259 toxic, were insect growth regulators (IGRs) and so would not be expected to show
260 negative effects until later. Several studies have looked at effects of fewer pesticides on
261 leafminer parasitoids in either field (Poe et al. 1978, Johnson et al. 1980, Oetting 1985,
262 Hara 1986, Weintraub and Horowitz 1998, Civelek and Weintraub 2003) or lab studies
263 (Bjorksten and Robinson 2005, Wu and Miyata 2005) and demonstrated toxic effects or
264 the lack thereof on natural enemies. This study however looked at a large number of
265 pesticides commonly applied against at least 6 major pests in the greenhouse gerbera

266 system and investigated their compatibility with natural enemies that have the potential of
267 controlling the two most important pests. Most other studies looked at fewer chemicals
268 targeting a single important pest in their respective systems.

269 ***Effects on D. isaea.*** Since *L. trifolii* are often chemically resistant, most of the chemicals
270 labelled for use against them rarely control populations to a significant level. However,
271 that seldom serves as an incentive to not spray pesticides in the greenhouses. Growers
272 often rely on pesticides as the only solution to pest problems as they (when effective)
273 allow for tangible and observable effects immediately, as opposed to biological control
274 methods which take more time and do not eliminate a pest completely. The knowledge
275 that novaluron, petroleum oil, azadirachtin, cyromazine and acetamiprid are at most
276 slightly harmful to the leafminer parasitoid could encourage the use of such chemicals for
277 leafminer control when inevitable. Mites are the most commonly encountered among the
278 secondary pests in this system and chemicals are effective in controlling them. Within
279 48h though, there were more miticides that were potentially harmless to the leafminer
280 parasitoid than harmful. That abamectin is toxic to parasitoids has been shown
281 previously (Hara 1986, Bjorksten and Robinson 2005). Our results on the effect of
282 spinosad corroborate similar findings in protected cultivation (Jones et al. 2005) and field
283 situations where high mortality was observed in hymenopterans in spite of its being
284 accepted by many as a biorational pesticide (Williams et al. 2003). This also cautions
285 and emphasizes the importance of individual components of an integrated management
286 program in cut flowers. Spinosad as a miticide has a recommended rate of 22 oz/100 gal
287 and as a thrips material 6 oz / 100 gal. Even though less toxic at the lower rate, spinosad
288 caused severe mortality to the leafminer parasitoid at both rates. Abamectin is the

289 industry standard for mite control and spinosad is an effective thrips control material.
290 Their both being harmful to natural enemies removes significant control options from a
291 grower's pesticide armory.

292 Apart from the IGRs, only spirotetramat and spiromesifen demonstrated potential
293 as whitefly insecticides that could integrate with biological control of the leafminer.
294 However, both are in the insecticide class 23 which inhibits acetyl CoA carboxylase
295 (IRAC 2011). This provides few options for rotation of pesticides. As a thrips control
296 material, flonicamid, cyfluthrin, acetamiprid, insecticidal soap, and *B. bassiana* were
297 seemingly safe to the leafminer parasitoid, but from a grower's perspective, the natural
298 products are not first choice options because they do not immediately show effects.
299 Flonicamid comes under the chemical class 9c and is a feeding blocker (IRAC 2011),
300 while the natural products effect control in other ways. Cyfluthrin, which comes in the
301 pyrethroid class, and acetamiprid, which is a neonicotinoid, could be effective
302 components though. Spinosad is effective for thrips control (Jones et al. 2005), but
303 demonstrated negative effects on parasitoid populations. Fungicides in general were
304 found to cause low mortality in the parasitoid wasp *D. isaea*. EcoSmart, a ready-to-use
305 rosemary oil concoction, and sulfur were the only fungicides among those tested (Tables
306 6, 7) that caused > 30% mortality in *D. isaea*, but still less than 79%, and thus would be
307 usable in IPM programs. Our data suggest that fungicides do not cause immediate
308 negative effects on leafminer parasitoids.

309 ***Effects on N. californicus*** Mites are the most frequently encountered secondary pests in
310 greenhouse gerberas. Unless a miticide specifically toxic to pest mite species is
311 available, integration of miticides and predatory mites would not be possible in an IPM

312 program. Cyromazine is accepted as being safe for natural enemies in general (Biobest ,
313 Koppert), and our study noted the same. However, we observed heightened activity by
314 the surviving mites in the vial closer to the lid. Whether the phenomenon is a synergistic
315 effect or a repellent effect needs closer investigation

316 From among the whitefly chemicals, flonicamid, thiomethoxam, spiromesifen,
317 and spirotetramat were only slightly harmful to predatory mites. Spiromesifen and
318 spirotetramat were safe options also to the leafminer parasitoids and thus add to the
319 number of rotational options. Among commonly used thrips control materials, only
320 flonicamid and insecticidal soap showed potential to integrate with pest mite biocontrol.
321 While miticides in general were not completely toxic to the insect natural enemy
322 (leafminer parasitoid), insecticides in general seemed to harm the non-insect natural
323 enemy (predatory mite).

324 The salient inference from the lab assays is identification of pesticides that can be
325 safely integrated with a biological control regime. Focusing on safety of the leafminer
326 parasitoid, *D. isaea*, primarily, there are slightly more pesticides that are potentially
327 compatible than with predatory mites (Table 7). Reevaluating our control options from
328 the available compatible chemistries to effectively rotate, and convincing growers to
329 adopt only those options in an IPM program would be the challenge going forward.

330 **Greenhouse Miticide Study**

331 Mites being the most frequently encountered among the secondary pests makes
332 their control an important component in any IPM program in this system. Our prolonged
333 greenhouse study showed that the residual effect of miticides was not detrimental to *D.*

334 *isaea* in the long run. Even though the parasitism rate dropped below 30% in the second
335 week, the fact that the fluctuation occurred in all treatments, including the control, and
336 that there were no differences in other parameters that were analyzed, indicates that the
337 effect was due to life history traits. After one week of high parasitism (> 70%), there
338 were very few leafminers for the parasitoids to parasitize the following week. All the
339 treatments followed a similar pattern and reached a peak parasitism by the fourth week,
340 which also meant that the miticides did not detrimentally affect *D. isaea* development in
341 the weeks prior (2nd or 3rd week) when the parasitoids were in younger and more
342 vulnerable stages. Results indicated that bifenazate, hexythiazox, spiromesifen,
343 acequinocyl, etoxazole, and clofentazine are not injurious at least in the long run for the
344 development and population buildup of *D. isaea*. This gives us valuable information for
345 integrating biological and chemical control to keep the most important pests in this
346 system in check. The primary pest can be controlled using its natural enemy, and the
347 major secondary pest can be controlled by rotating safe chemicals that do not harm the
348 leafminer parasitoid, *D. isaea*.

349 Additionally, from these results (Table 7), we would be able to integrate options
350 to control the primary pest in this system (leafminer) using its natural enemies and use
351 less disruptive options from among the chemicals to control the secondary pests. The
352 benefits from such a strategy are multifold, 1) reduced pesticide footprint in the premises
353 and environment, 2) enhanced safety to the workers and producers alike, 3) better
354 management of the pest and diseases leading to a better crop, and 4) overall a sustainable
355 production system. With the increase of insecticide resistant pests, the possibility of

356 insecticide resistant natural enemies (Rosenheim and Hoy 1988) will need to be strongly
357 explored.

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Acknowledgements

361

We greatly appreciate the technical assistance of Tina Thomas, Monica

362

Townsend, and Sherrie Stevens in the conduct of these experiments. Funding was

363

provided by the Georgia Department of Agriculture as a Specialty Crop Initiative Grant.

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References Cited

368 **Biobest.** Side effects manual. In <http://www.biobest.be/neveneffecten/3/search-itmq/>
369 [ed.].

370 **Bjorksten, T. A., and M. Robinson. 2005.** Juvenile and sublethal effects of selected
371 pesticides on the leafminer parasitoids *Hemiptarsenus varicornis* and *Diglyphus*
372 *isaea* (Hymenoptera: Eulophidae) from Australia. Journal of Economic
373 Entomology 98: 1831-1838.

374 **Civelek, H. S., and P. G. Weintraub. 2003.** Effects of bensultap on larval serpentine
375 leafminers, *Liriomyza trifolii* (Burgess)(Diptera: Agromyzidae), in tomatoes. Crop
376 Protection 22: 479-483.

377 **Hara, A. H. 1986.** Effects of certain insecticides on *Liriomyza trifolii* (Burgess) (Diptera:
378 Agromyzidae) and its parasitoids on chrysanthemums in Hawaii. Proceedings of
379 the Hawaiian Entomological Society 26: 65-70.

380 **IRAC. 2011.** IRAC MoA Classification Scheme, pp. 1-23, [http://www.irac-](http://www.irac-online.org/wp-content/uploads/2009/09/MoA_Classification.pdf)
381 [online.org/wp-content/uploads/2009/09/MoA_Classification.pdf](http://www.irac-online.org/wp-content/uploads/2009/09/MoA_Classification.pdf).

382 **Johnson, M. W., E. R. Oatman, and I. A. Wyman. 1980.** Effects of insecticides on
383 populations of the vegetable leafminer and associated parasites on summer pole
384 tomatoes. Journal of Economic Entomology 73: 61-66.

385 **Jones, T., C. S. Dupree, R. Harris, L. Shipp, and B. Harris. 2005.** The efficacy of
386 spinosad against the western flower thrips, *Frankliniella occidentalis*, and its
387 impact on associated biological control agents on greenhouse cucumbers in
388 southern Ontario. Pest Management Science 61: 179-185.

- 389 **Keil, C. B., and M. P. Parrella. 1982.** *Liriomyza trifolii* on chrysanthemums and celery:
390 managing an insecticide resistant population, pp. 162-167. In S. L. Poe [ed.], 3rd
391 Annual Industry Conference on the Leafminer, San Diego, California.
- 392 **Koppert, B. S.** Side Effects, <http://side-effects.koppert.nl/>.
- 393 **Liu, T.-X., L. Kang, K. M. Heinz, and J. T. Trumble. 2009.** Biological control of
394 *Liriomyza* leafminers: progress and perspective. Perspectives in Agriculture,
395 Veterinary Science, Nutrition and Natural Resources 4: 1-16.
- 396 **Oetting, R. D. 1985.** Effects of insecticides applied to potting media on *Oenonogastra*
397 *microrhopalae* (Ashmead) parasitization of *Liriomyza trifolii* (Burgess). Journal
398 of Entomological Science 20: 405-410.
- 399 **Parrella, M. P., V. P. Jones, R. R. Youngman, and L. M. LeBeck. 1985.** Effect of leaf
400 mining and leaf stippling of *Liriomyza* spp. on photosynthetic rates of
401 chrysanthemum. Annals of the Entomological Society of America 78: 90-93.
- 402 **Poe, S. L., P. H. Everett, D. J. Schuster, and C. A. Musgrave. 1978.** Insecticidal
403 effects on *Liriomyza sativae* larvae and their parasites on tomato. Journal of the
404 Georgia Entomological Society 13: 322-327.
- 405 **Reitz, S. R., and J. T. Trumble. 2002.** Interspecific and intraspecific differences in two
406 *Liriomyza* leafminer species in California. Entomologia Experimentalis et
407 Applicata 102: 101-113.
- 408 **Rosenheim, J. A., and M. A. Hoy. 1988.** Genetic improvement of a parasitoid biological
409 control agent: artificial selection for insecticide resistance in *Aphytis melinus*
410 (Hymenoptera: Aphelinidae). Journal of Economic Entomology 81: 1539-1550.

411 **Stark, J. D., R. Vargas, and J. E. Banks. 2007.** Incorporating ecologically relevant
412 measures of pesticide effect for estimating the compatibility of pesticides and
413 biocontrol agents. *Journal of Economic Entomology* 100: 1027-1032.

414 **Weintraub, P. G., and A. R. Horowitz. 1998.** Effects of translaminar versus
415 conventional insecticides on *Liriomyza huidobrensis* (Diptera: Agromyzidae) and
416 *Diglyphus isaea* (Hymenoptera: Eulophidae) populations in celery. *Journal of*
417 *Economic Entomology* 91: 1180-1185.

418 **Williams, T., J. Valle, and E. Viñuela. 2003.** Is the naturally derived insecticide
419 Spinosad® compatible with insect natural enemies? *Biocontrol Science and*
420 *Technology* 13: 459-475.

421 **Wu, G., and T. Miyata. 2005.** Susceptibilities to methamidophos and enzymatic
422 characteristics in 18 species of pest insects and their natural enemies in crucifer
423 vegetable crops. *Pesticide Biochemistry and Physiology* 82: 79-93.

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Table 1. List of chemicals with trade name, active ingredients, formulation, median label rates (per 100 gallon of water unless otherwise mentioned) for respective target pests.

Trade name	Active Ingredient	Target Pests					
		Spider mites	Leaf miners	Thrips	White flies	Aphids	Fungal Pathogens
Avid 0.15 EC	Abamectin		4 oz			8 oz	--
Ultiflora	Milbemectin	12 fl oz	--	--	--	--	--
TetraSan 5WDG	Etoxazole	12 oz	--	--	--	--	--
Floramite WSP	Bifenazate	3 fl oz	--	--	--	--	--
Hexygon DF	Hexythiazox	1.5 fl oz	--	--	--	--	--
Judo	Spiromesifen	2.5 fl oz	--	--	3 fl oz	--	--
Ovation SC	Clofentezine	2 fl oz	--	--	--	--	--
Pylon	Chlorfenapyr	3.9 fl oz	--	15 fl oz	--	--	--
Sanmite WP	Pyridaben	4 fl oz	--	--	5 fl oz	--	--
Shuttle O	Acequinocyl	9.6 fl oz	--	--	--	--	--
Conserve SC	Spinosad		22 fl oz	6 fl oz	--	--	--
DuraGuard ME	Chlorpyrifos			37.5 fl oz			--
Kontos	Spirotetramat	--	--	--	1.7 fl oz		--
Pedestal SC	Novaluron	--		7 fl oz		--	--
Citation WP	Cyromazine		2.66 oz			2.66 oz	--

Safari 20 SG	Dinotefuran	--		0.375 lb			--
Azatin XL	Azadirachtin	--	13 fl oz	14 fl oz	13 fl oz	14 fl oz	--
Scimitar GC	Lambda	4 oz		3.25oz	4 oz	3.25 oz	--
	Cyhalothrin						
TriStar 30 SG	Acetamiprid	--	7.35 fl oz	6 fl oz	4 fl oz	1.3 fl oz	--
Flagship 25 WG	Thiamethoxam	--	--	--		3 oz	--
Aria	Flonicamid	--	--	2.5 oz	3.6 oz	0.9 oz	--
TalstarOne	Bifenthrin	16.25 fl oz	32.6 fl oz		16.25 fl oz		--
Naturalis L	<i>B. bassiana</i>	65 fl oz	--		65 fl oz		--
Mavrik Aquaflow	Fluvalinate	7 fl oz	--		7 fl oz		--
Marathon 1 G	Imidacloprid	--		15 oz/ 1000 sq. ft.			--
Decathlon 20 WP	Cyfluthrin	--	--		1.9 oz		--
Distance	Pyriproxyfen	--	--	--	7 fl oz	--	--
PureSpray Oil	Petroleum Oil	2-5 tbsp/ gal		--		2-5 tbsp/ gal	
Enstar	Kinoprene				7.5 fl oz		
MPede	Insecticidal Soap				2 gal		
Pipron LC	Piperalin	--	--	--	--	--	6 fl oz
Milstop	Potassium bicarbonate	--	--	--	--	--	2.5 lbs
Pageant	Pyraclostrobin	--	--	--	--	--	9 oz

EcoSmart RTU	Rosemary Oil	--	--	--	--	--	
Sulfur 6L	Sulfur	--	--	--	--	--	6 fl oz
Aliette WDG	Fosetyl-aluminum	--	--	--	--	--	64 oz
Strike 50 WDG	Butanone	--	--	--	--	--	2 oz
Phyton 27	Copper Sulfate	--	--	--	--	--	2 fl oz
Heritage	Azoxystrobin	--	--	--	--	--	20 oz

Table 2. Means (\pm SE) of number of live natural enemies (*D. isaea* and *N. californicus*) at each observation time of 12, 24, and 48 h in each of three trials (Tr 1, Tr 2, Tr 3) after exposure to leafminer-targeted materials at median label rates (Table 1) out of a total of 10 natural enemies in each experimental unit.

12 h	<i>D. isaea</i>			<i>N. californicus</i>		
Treatment	Tr 1	Tr 2	Tr 3	Tr 1	Tr 2	Tr 3
Control	9.2 \pm 0.25a	9.8 \pm 0.13a	9.7 \pm 0.15a	8.6 \pm 0.54a	7.9 \pm 0.72a	9.0 \pm 0.42a
Spiromesifen	8.1 \pm 0.6ab	9.0 \pm 0.39a	9.4 \pm 0.27a	8 \pm 0.52ab	3.5 \pm 1.14bc	5.0 \pm 1.11bc
Cyromazine	9.0 \pm 0.52ab	9.0 \pm 0.26a	8.9 \pm 0.31a	8.7 \pm 0.42a	7.0 \pm 0.67a	7.2 \pm 1.19ab
Novaluron	6.6 \pm 0.85bc	10 \pm 0a	9.1 \pm 0.31a	6.4 \pm 0.83abc	2.6 \pm 1.09b-d	2.3 \pm 0.6cd
Petroleum Oil	5.0 \pm 0.77cd	9.9 \pm 0.1a	9.4 \pm 0.22a	4.4 \pm 0.69c	5.0 \pm 0.93ab	6.1 \pm 1.12ab
Azadirachtin	8.6 \pm 0.3ab	9.3 \pm 0.26a	9.1 \pm 0.23a	5.8 \pm 0.59bc	5.2 \pm 0.55ab	2.4 \pm 0.52cd
Acetamiprid	7.3 \pm 0.56abc	8.3 \pm 0.42a	6.2 \pm 0.47b	1.4 \pm 0.48d	1.3 \pm 0.42cd	1.7 \pm 0.4cd
Dinotefuran	1.3 \pm 0.45e	4.8 \pm 0.65b	3.8 \pm 0.51c	0.3 \pm 0.21d	1.2 \pm 0.39cd	0.0 \pm 0d
Bifenthrin	1.1 \pm 0.38e	2.6 \pm 0.27c	2.0 \pm 0.58c	0.0 \pm 0d	0.0 \pm 0d	0.0 \pm 0d
Lambda cyhalothrin	3.1 \pm 0.55de	5.0 \pm 0.76b	2.8 \pm 0.61c	0.0 \pm 0d	0.2 \pm 0.13d	0.0 \pm 0d

df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99
<i>f</i>	30.90	46.00	40.11	49.46	18.13	22.43
P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
24 h						
Control	8.4 ± 0.45ab	9.8 ± 0.13a	9.7 ± 0.15a	8.4 ± 0.54ab	7.6 ± 0.73a	9.0 ± 0.42a
Spiromesifen	6.0 ± 0.7bcd	8.7 ± 0.52ab	8.9 ± 0.43a	6.6 ± 0.37abc	3.5 ± 1.14bc	4.8 ± 1.05bc
Cyromazine	8.9 ± 0.5a	7.7 ± 0.58b	8.8 ± 0.29a	8.5 ± 0.43a	6.8 ± 0.61a	7.2 ± 1.19ab
Novaluron	5.6 ± 0.88cd	9.5 ± 0.40ab	9.1 ± 0.31a	5.9 ± 1.0bc	2.6 ± 1.09b-d	2.3 ± 0.6cd
Petroleum Oil	4.0 ± 0.84de	9.7 ± 0.15ab	8.9 ± 0.31a	4.2 ± 0.63c	5.0 ± 0.93ab	5.9 ± 1.05ab
Azadirachtin	8.0 ± 0.37abc	8.2 ± 0.42ab	8.6 ± 0.31a	4.7 ± 0.87c	4.8 ± 0.63ab	2.0 ± 0.47cd
Acetamiprid	6.7 ± 0.56abc	7.8 ± 0.51ab	6.2 ± 0.47b	0.9 ± 0.41d	0.9 ± 0.31cd	1.7 ± 0.4cd
Dinotefuran	1.1 ± 0.38f	2.9 ± 0.57cd	3.3 ± 0.58c	0.1 ± 0.1d	0.8 ± 0.33cd	0.0 ± 0d
Bifenthrin	0.7 ± 0.3f	1.0 ± 0.15d	1.9 ± 0.59c	0.0 ± 0d	0.0 ± 0d	0.0 ± 0d
Lambda cyhalothrin	1.8 ± 0.39ef	3.5 ± 0.56c	1.8 ± 0.44c	0.0 ± 0d	0.0 ± 0d	0.0 ± 0d
df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99

<i>f</i>	28.67	53.82	66.47	38.24	18.18	22.02
P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
48 h						
Control	7.7 ± 0.52a	9.6 ± 0.22a	9.0 ± 0.42a	8.0 ± 0.6a	7.0 ± 0.92a	8.4 ± 0.97a
Spiromesifen	5.3 ± 0.68ab	7.8 ± 0.63abc	7.9 ± 0.53ab	6.4 ± 0.4a	3.5 ± 1.14bc	3.9 ± 0.91bc
Cyromazine	7.6 ± 0.62a	6.6 ± 0.62c	6.4 ± 0.58bc	8.1 ± 0.53a	6.8 ± 0.61a	6.4 ± 1.38ab
Novaluron	4.2 ± 0.7b	8.9 ± 0.57ab	7.7 ± 0.5ab	5.8 ± 1.05ab	2.6 ± 1.09b-d	0.8 ± 0.7cd
Petroleum Oil	2.7 ± 0.83bc	8.7 ± 0.56abc	7.4 ± 0.4abc	3.9 ± 0.72b	4.2 ± 0.89ab	5.9 ± 1.05ab
Azadirachtin	7.4±0.58a	6.6±0.6c	6.6±0.52bc	0.9±0.28c	0.6±0.43cd	0.0 ± 0d
Acetamiprid	5.3 ± 0.68ab	7.1 ± 0.48bc	5.4 ± 0.37c	0.2 ± 0.13c	0.1 ± 0.1d	0.7 ± 0.3cd
Dinotefuran	0.4 ± 0.16c	1.1 ± 0.35d	2.4 ± 0.45d	0.0 ± 0c	0.0 ± 0d	0.0 ± 0d
Bifenthrin	0.2 ± 0.13c	0.8 ± 0.2d	1.5 ± 0.56d	0.0 ± 0c	0.0 ± 0d	0.0 ± 0d
Lambda cyhalothrin	1.0 ± 0.33c	1.8 ± 0.55d	0.6 ± 0.22d	0.0 ± 0c	0.0 ± 0d	0.0 ± 0d
df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99
<i>f</i>	27.04	47.96	39.45	46.24	16.84	18.32

P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
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Table 3. Means (\pm SE) of number of live natural enemies (*D. isaea* and *N. californicus*) at each observation time of 12, 24, and 48 h in each of three trials (Tr 1, Tr 2, Tr 3) after exposure to miticides at median label rates (Table 2.1) out of a total of 10 natural enemies in each experimental unit.

12 h	<i>D. isaea</i>			<i>N. californicus</i>		
	Treatment	Tr 1	Tr 2	Tr 3	Tr 1	Tr 2
Control	4.5 \pm 0.75b	9.0 \pm 0.21a	9.1 \pm 0.43a	5.8 \pm 0.95a	9.0 \pm 0.3a	5.4 \pm 0.43b
Hexythiazox	8.7 \pm 0.58a	8.9 \pm 0.38a	8.9 \pm 0.46a	4.0 \pm 0.7ab	7.7 \pm 0.47a	6.0 \pm 0.56ab
Milbemectin	8.6 \pm 0.33a	9.0 \pm 0.37a	8.6 \pm 0.37a	1.2 \pm 0.33c	0.4 \pm 0.22d	0.5 \pm 0.22d
Clofentezine	8.6 \pm 0.5a	9.2 \pm 0.25a	8.5 \pm 0.54a	4.6 \pm 0.69a	7.9 \pm 0.62a	7.7 \pm 0.52a
Spiromesifen	7.9 \pm 0.53a	9.2 \pm 0.33a	8.7 \pm 0.54a	6.6 \pm 0.87a	7.0 \pm 0.79a	7.6 \pm 0.4a
Bifenazate	7.6 \pm 0.72a	8.9 \pm 0.41a	8.8 \pm 0.39a	5.0 \pm 0.49a	8.3 \pm 0.3a	5.9 \pm 0.50ab
Etoxazole	2.6 \pm 0.62bc	9.5 \pm 0.34a	8.4 \pm 0.48a	5.9 \pm 0.55a	7.67 \pm 0.62a	7.0 \pm 0.56ab
Acequinocyl	2.875 \pm 0.6b	8.89 \pm 0.39a	8.8 \pm 0.66a	1.7 \pm 0.47bc	4.3 \pm 0.83b	3.1 \pm 0.55c
Abamectin	3.2 \pm 0.42b	2.0 \pm 0.42b	4.7 \pm 0.65b	1.8 \pm 0.33bc	3.6 \pm 0.69bc	1.7 \pm 0.45cd

Spinosad	0.2 ± 0.13c	0.0 ± 0c	0.1 ± 0.1c	1.0 ± 0.33c	1.0 ± 0.33cd	0.6 ± 0.22d
df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99
<i>f</i>	31.62	119.51	34.49	13.43	30.21	39.37
P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
24 h						
Control	3.4 ± 0.79b	8.3 ± 0.3a	9.0 ± 0.42a	5.0 ± 0.94abc	7.7 ± 0.47a	5.1 ± 0.41b
Hexythiazox	7.6 ± 0.78a	8.6 ± 0.43a	7.4 ± 0.52a	2.5 ± 0.72cdef	6.8 ± 0.57a	5.7 ± 0.63ab
Milbemectin	7.7 ± 0.42a	8.1 ± 0.48a	7.9 ± 0.59a	0.2 ± 0.13f	0.1 ± 0.1d	0.0 ± 0.0c
Clofentezine	7.1 ± 0.53a	8.2 ± 0.44a	7.6 ± 0.64a	3.3 ± 0.63bcde	6.67 ± 0.57a	7.3 ± 0.62a
Spiromesifen	7.0 ± 0.67a	8.9 ± 0.38a	6.9 ± 0.78a	6.3 ± 0.86a	5.8 ± 0.88ab	7.4 ± 0.34a
Bifenazate	7.0 ± 0.79a	8.6 ± 0.43a	7.7 ± 0.45a	3.8 ± 0.77abcd	7.0 ± 0.54a	5.1 ± 0.64b
Etoxazole	2.4 ± 0.6bc	9.2 ± 0.33a	7.6 ± 0.72a	5.3 ± 0.7ab	6.67 ± 0.52a	6.9 ± 0.59ab
Acequinocyl	2.25 ± 0.6bc	8.75 ± 0.52a	8.5 ± 0.65a	1.2 ± 0.42def	3.6 ± 0.86bc	1.9 ± 0.50c
Abamectin	2.6 ± 0.43bc	1.0 ± 0.42b	3.2 ± 0.55b	0.9 ± 0.31ef	2.2 ± 0.39cd	1.2 ± 0.42c
Spinosad	0.2 ± 0.13c	0.0 ± 0b	0.0 ± 0c	0.7 ± 0.26ef	0.4 ± 0.22d	0.1 ± 0.1c

df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99
<i>f</i>	20.50	85.14	24.88	13.23	23.34	38.70
P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
48 h						
Control	2.3 ± 0.6b	8.2 ± 0.29ab	9.0 ± 0.42a	4.4 ± 0.97abc	6.7 ± 0.56a	4.8 ± 0.33b
Hexythiazox	6.6 ± 0.62a	8.3 ± 0.40ab	6.3 ± 0.68ab	1.9 ± 0.8cde	5.3 ± 0.75a	5.5.65±0.53ab
Milbemectin	7.2 ± 0.25a	6.8 ± 0.39b	6.7 ± 0.7ab	0.0 ± 0e	0.0 ± 0c	0.0 ± 0.0c
Clofentezine	5.6 ± 0.69a	7.8 ± 0.55ab	7.1 ± 0.74ab	3.0 ± 0.71bcd	6.3 ± 0.56a	7.3 ± 0.62a
Spiromesifen	6.0 ± 0.63a	8.5 ± 0.40ab	5.8 ± 0.77b	5.8 ± 0.99a	3.9 ± 1.07ab	7.2 ± 0.39a
Bifenazate	5.6 ± 0.72a	8.4 ± 0.45ab	6.1 ± 0.71ab	3.4 ± 0.78abcd	5.8 ± 0.81a	5.0 ± 0.65b
Etoazole	1.9 ± 0.5b	8.8 ± 0.36a	6.9 ± 0.94ab	4.7 ± 0.7ab	6.2a ± 0.61a	6.6 ± 0.64ab
Acequinocyl	1.5 ± 0.6b	7.89 ± 0.60ab	7.1 ± 0.81ab	0.8 ± 0.39de	2.1 ± 0.85bc	0.9 ± 0.43c
Abamectin	1.3 ± 0.26b	0.0 ± 0c	1.7 ± 0.50c	0.0 ± 0e	1.3 ± 0.26bc	0.5 ± 0.31c
Spinosad	0.0 ± 0b	0.0 ± 0c	0.0 ± 0c	0.0 ± 0e	0.1 ± 0.1c	0.1 ± 0.1c
df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99

<i>f</i>	23.53	84.97	17.46	12.85	16.68	43.56
P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Table 4. Means (\pm SE) of number of live natural enemies (*D. isaea* and *N. californicus*) at each observation time of 12, 24, and 48 h in each of three trials (Tr 1, Tr 2, Tr 3) after exposure to whitefly-targeted materials at median label rates (Table 2.1) out of a total of 10 natural enemies in each experimental unit.

12 h	<i>D. isaea</i>			<i>N. californicus</i>		
	Tr 1	Tr 2	Tr 3	Tr 1	Tr 2	Tr 3
Control	8.6 \pm 0.4a	9.2 \pm 0.36a	9.1 \pm 0.38a	3.1 \pm 0.7bc	8.6 \pm 0.43a	8.0 \pm 0.65a
Spirotetramat	8.0 \pm 0.49ab	8.1 \pm 0.38a	9.3 \pm 0.26a	4.8 \pm 0.84ab	3.6 \pm 0.87cde	5.4 \pm 0.65bc
Pyriproxyfen	8.5 \pm 0.37a	8.3 \pm 0.37a	8.7 \pm 0.26a	2.6 \pm 0.62bcd	3.2 \pm 0.51cde	2.2 \pm 0.39ef
Flonicamid	6.4 \pm 0.59abc	7.4 \pm 0.45ab	7.9 \pm 0.66a	6.8 \pm 0.7a	7.6 \pm 0.86ab	7.3 \pm 0.68ab
Kinoprene	8.4 \pm 0.34ab	7.7 \pm 0.56a	9.1 \pm 0.23a	2.2 \pm 0.47bcd	2.8 \pm 0.69c-f	2.9 \pm 0.46de
Chlorpyrifos	4.5 \pm 0.7cde	5.7 \pm 0.3bc	8.8 \pm 0.62a	4.2 \pm 0.57ab	4.0 \pm 0.63cd	3.8 \pm 0.61cde
Pyridaben	4.9 \pm 0.35cd	3.8 \pm 0.39cd	8.5 \pm 0.5a	0.7 \pm 0.47cd	0.4 \pm 0.22f	1.4 \pm 0.3ef
Lambda Cyhalothrin	2.5 \pm 0.43e	4.0 \pm 0.61cd	5.1 \pm 0.53b	0.2 \pm 0.13d	0.9 \pm 0.46ef	0.2 \pm 0.13f
Imidacloprid	6.1 \pm 0.67bc	3.0 \pm 0.43d	4.33 \pm 0.59b	1.5 \pm 0.64cd	1.63 \pm 0.48d-f	2.5 \pm 0.43ef

Thiamethoxam	3.0 ± 0.49de	2.3 ± 0.40d	3.3 ± 0.84b	4.2 ± 0.47ab	5.3 ± 0.56bc	5.2 ± 0.81bcd
df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99
<i>f</i>	20.35	34.07	20.24	12.19	20.19	23.92
P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
24 h						
Control	8.4 ± 0.48a	9.1 ± 0.41a	8.9 ± 0.43a	2.9 ± 0.64bcd	8.2 ± 0.51a	7.7 ± 0.73a
Spirotetramat	6.3 ± 0.75abc	6.9 ± 0.6ab	9.2 ± 0.33a	4.3 ± 0.76ab	3.2 ± 0.95b	5.2 ± 0.69abc
Pyriproxyfen	7.5 ± 0.56ab	6.9 ± 0.55ab	8.1 ± 0.41a	1.4 ± 0.52cde	2.1 ± 0.6bcd	1.8 ± 0.33de
Flonicamid	5.6 ± 0.4bcd	6.0 ± 0.73b	7.6 ± 0.7a	6.6 ± 0.78a	7.3 ± 0.96a	7.0 ± 0.76ab
Kinoprene	5.8 ± 0.66abc	5.7 ± 0.45b	7.6 ± 0.27a	0.7 ± 0.3de	1.4 ± 0.3bcd	2.3 ± 0.45de
Chlorpyrifos	3.0 ± 0.7de	4.7 ± 0.37bc	8.1 ± 0.54a	3.6 ± 0.62bc	2.9 ± 0.64bc	3.3 ± 0.67cd
Pyridaben	4.4 ± 0.37cde	3.0 ± 0.36cd	7.1 ± 0.84a	0.5 ± 0.34de	0.0 ± 0d	0.1 ± 0.1e
Lambda Cyhalothrin	2.1 ± 0.38e	3.0 ± 0.54cd	4.2 ± 0.59b	0.0 ± 0e	0.3 ± 0.21cd	0.0 ± 0e
Imidacloprid	5.3 ± 0.82bcd	2.63 ± 0.42cd	3.1 ± 0.58b	1.2 ± 0.59cde	0.13 ± 0.1cd	1.25 ± 0.33de
Thiamethoxam	1.7 ± 0.47e	1.6 ± 0.43d	3.0 ± 0.9b	2.9 ± 0.59bcd	3.3 ± 0.67b	4.9 ± 0.95bc

df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99
<i>f</i>	14.13	21.45	15.23	14.11	22.19	24.55
P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
48 h						
Control	7.6 ± 0.43a	9.0 ± 0.47a	8.1 ± 0.67a	2.3 ± 0.42bcd	8.0 ± 0.5a	7.4 ± 0.85a
Spirotetramat	5.3 ± 0.87ab	6.3 ± 0.72b	9.1 ± 0.35a	3.8 ± 0.77b	2.9 ± 1.01bc	5.0 ± 0.75ab
Pyriproxyfen	7.1 ± 0.5a	6.2 ± 0.57b	7.6 ± 0.45a	0.7 ± 0.3de	0.1 ± 0.1d	0.8 ± 0.25d
Flonicamid	4.4 ± 0.43b	5.5 ± 0.73bc	6.6 ± 0.9a	6.0 ± 0.86a	6.8 ± 1.06a	4.9 ± 0.77ab
Kinoprene	1.5 ± 0.37c	3.2 ± 0.39cde	2.5 ± 0.48b	0.0 ± 0e	0.0 ± 0d	0.0 ± 0d
Chlorpyrifos	1.7 ± 0.3c	3.8 ± 0.36cd	7.7a	1.4 ± 0.34cde	1.1 ± 0.74b-d	2.2 ± 0.42cd
Pyridaben	3.2 ± 0.44bc	2.5 ± 0.27de	6.6 ± 0.9a	0.2 ± 0.2e	0.0 ± 0d	0.0 ± 0d
Lambda Cyhalothrin	1.0 ± 0.26c	2.1 ± 0.62de	2.4 ± 0.43b	0.0 ± 0e	0.3 ± 0.21cd	0.0 ± 0d
Imidacloprid	4.4 ± 0.95b	1.75 ± 0.37de	1.63 ± 0.43b	0.0 ± 0e	0.0 ± 0d	0.13 ± 0.1d
Thiamethoxam	1.1 ± 0.38c	1.0 ± 0.37e	1.9 ± 0.77b	2.7 ± 0.5bc	3.2 ± 0.68b	4.5 ± 1.07bc
df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99

<i>f</i>	20.07	24.71	20.39	21.70	24.94	24.88
P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Table 5. Means (\pm SE) of number of live natural enemies (*D. isaea* and *N. californicus*) at each observation time of 12, 24, and 48 h in each of three trials (Tr 1, Tr 2, Tr 3) after exposure to thrips materials (thripicides) at median label rates (Table 2.1) out of a total of 10 natural enemies in each experimental unit.

12 h	<i>D. isaea</i>			<i>N. californicus</i>		
Treatment	Tr 1	Tr 2	Tr 3	Tr 1	Tr 2	Tr 3
Control	9.3 \pm 0.5a	8.9 \pm 0.28a	9.9 \pm 0.1a	7.6 \pm 0.67a	7.3 \pm 0.76a	8.9 \pm 0.5a
Acetamiprid	7.4 \pm 0.64ab	7.5 \pm 0.43ab	7.9 \pm 0.43b	1.6 \pm 0.65de	6.5 \pm 0.62ab	4.5 \pm 1.13c
Flonicamid	8.2 \pm 0.55a	9.0 \pm 0.39a	8.0 \pm 0.26b	5.9 \pm 0.8ab	7.6 \pm 0.7a	5.7 \pm 0.75bc
Insecticidal soap	9.8 \pm 0.2a	8.2 \pm 0.49ab	8.6 \pm 0.4ab	4.2 \pm 1.11bcd	5.7 \pm 0.52ab	7.6 \pm 0.6ab
<i>B. bassiana</i>	8.1 \pm 0.69a	8.2 \pm 0.13ab	7.7 \pm 0.3b	5.0 \pm 0.45abc	5.5 \pm 0.54ab	5.4 \pm 0.52bc
Cyfluthrin	4.6 \pm 0.76c	6.3 \pm 0.45bc	5.5 \pm 0.56c	0.4 \pm 0.4e	2.1 \pm 0.43cd	1.2 \pm 0.33d
Fluvalinate	5.4 \pm 0.75bc	4.5 \pm 0.62cd	4.7 \pm 0.52c	0.2 \pm 0.2e	0.3 \pm 0.15d	0.6 \pm 0.22d
Abamectin	4.6 \pm 0.56c	4.3 \pm 0.5cd	8.7 \pm 0.3ab	2.4 \pm 0.52cde	4.5 \pm 0.62bc	5.6 \pm 0.58bc
Carbonitrile	5.0 \pm 0.49bc	4.1 \pm 0.84d	7.7 \pm 0.54b	0.4 \pm 0.22e	1.9 \pm 0.35d	4.5 \pm 0.86c

Spinosad	1.7 ± 0.37c	0.4 ± 0.16e	1.3 ± 0.37c	1.4 ± 0.72de	6.9 ± 0.55ab	6.9 ± 0.57ab
df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99
<i>f</i>	19.38	34.95	40.68	17.21	20.64	15.05
P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
24 h						
Control	8.9 ± 0.6a	8.1 ± 0.31a	9.3 ± 0.26a	7.4 ± 0.72a	7.1 ± 0.71a	8.7 ± 0.52a
Acetamiprid	6.9 ± 0.74ab	7.0 ± 0.4a	7.1 ± 0.53b	1.6 ± 0.65cde	5.9 ± 0.5ab	3.0 ± 0.77cde
Flonicamid	7.2 ± 0.59ab	8.2 ± 0.49a	7.1 ± 0.41b	5.8 ± 0.84ab	5.0 ± 0.76abc	5.2 ± 0.8bc
Insecticidal soap	9.1 ± 0.43a	7.4 ± 0.4a	8.4 ± 0.45ab	4.1 ± 1.14bcd	3.3 ± 0.45cd	7.5 ± 0.58ab
<i>B. bassiana</i>	6.9 ± 0.82ab	7.4 ± 0.34a	7.6 ± 0.3ab	4.4 ± 0.58bc	4.7 ± 0.52bc	3.6 ± 0.27c
Cyfluthrin	3.3 ± 0.73c	4.2 ± 0.76b	4.6 ± 0.56cd	0.4 ± 0.4e	0.2 ± 0.2e	0.8 ± 0.33ef
Fluvalinate	4.7 ± 0.63bc	3.0 ± 0.67b	3.9 ± 0.59d	0.1 ± 0.1e	0.0 ± 0e	0.2 ± 0.2f
Abamectin	2.2 ± 0.63cd	2.9 ± 0.57b	6.7 ± 0.62bc	2.4 ± 0.52cde	2.3 ± 0.52de	3.5 ± 0.58cd
Carbonitrile	2.6 ± 0.4cd	2.2 ± 0.8bc	3.5 ± 0.56d	0.4 ± 0.22e	0.1 ± 0.1e	1.1 ± 0.31def
Spinosad	0.5 ± 0.17d	0.3 ± 0.15c	1.0 ± 0.3e	1.4 ± 0.72de	6.3 ± 0.67ab	4.6 ± 0.58c

df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99
<i>f</i>	24.89	29.06	29.03	15.12	27.40	28.48
P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
48 h						
Control	7.6 ± 0.58ab	6.9 ± 0.38a	7.2 ± 0.25a	7.0 ± 0.68a	6.0 ± 0.68a	8.6 ± 0.56a
Acetamiprid	4.5 ± 0.58cd	6.9 ± 0.41a	6.7 ± 0.54a	0.9 ± 0.38cd	2.4 ± 0.62b	2.1 ± 0.71bcd
Fonicamid	6.0 ± 0.75bc	6.8 ± 0.44a	6.5 ± 0.40a	4.4 ± 0.99ab	0.7 ± 0.15c	4.6 ± 0.82b
Insecticidal Soap	8.5 ± 0.37a	6.7 ± 0.3a	6.9 ± 0.4a	3.1 ± 1.31bc	1.2 ± 0.25bc	2.8 ± 1.18bc
<i>B. bassiana</i>	5.9 ± 0.87bc	6.1 ± 0.5a	6.7 ± 0.56a	3.7 ± 0.65bc	1.2 ± 0.39bc	0.0 ± 0d
Cyfluthrin	1.6 ± 0.45e	2.5 ± 0.86b	3.6 ± 0.5bc	0.1 ± 0.1d	0.0 ± 0c	0.0 ± 0d
Fluvalinate	2.7 ± 0.63de	2.0 ± 0.63bc	2.2 ± 0.47cd	0.0 ± 0d	0.0 ± 0c	0.0 ± 0d
Abamectin	1.0 ± 0.33e	2.0 ± 0.45bc	4.2 ± 0.61b	0.0 ± 0d	0.0 ± 0c	0.0 ± 0d
Chlorfenapyr	0.8 ± 0.25e	1.0 ± 0.47bc	0.5 ± 0.17de	0.0 ± 0d	0.0 ± 0c	0.0 ± 0d
Spinosad	0.3 ± 0.15e	0.1 ± 0.1c	0.2 ± 0.13e	1.2 ± 0.59cd	0.0 ± 0c	0.7 ± 0.33cd
df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99

<i>f</i>	32.47	31.20	40.96	15.04	32.61	27.01
P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Table 6. Means (\pm SE) of number of live natural enemies (*D. isaea* and *N. californicus*) at each observation time of 12, 24, and 48 h in each of three trials (Tr 1, Tr 2, Tr 3) after exposure to fungicides at median label rates (Table 2.1) out of a total of 10 natural enemies in each experimental unit.

12 h						
	<i>D. isaea</i>			<i>N. californicus</i>		
Treatment	Tr 1	Tr 2	Tr 3	Tr 1	Tr 2	Tr 3
Control	8.9 \pm 0.43a	6.9 \pm 0.43b	8.8 \pm 0.63a	8.4 \pm 0.45a	9.0 \pm 0.39a	9.3 \pm 0.39a
Sulfur	8.4 \pm 0.34a	8.9 \pm 0.28a	8.4 \pm 0.33a	5.7 \pm 0.94abc	7.5 \pm 0.34abc	5.1 \pm 1.12bc
Piperalin	9.0 \pm 0.3a	8.7 \pm 0.42ab	9.3 \pm 0.26a	0.0 \pm 0e	0.0 \pm 0e	1.5 \pm 0.5c
Pyraclostrobin	9.4 \pm 0.22a	9.3 \pm 0.26a	9.2 \pm 0.42a	3.1 \pm 0.59cd	5.5 \pm 0.78cd	7.8 \pm 1.05ab
Fosetyl-aluminum	9.5 \pm 0.22a	9.4 \pm 0.22a	8.9 \pm 0.41a	2.7 \pm 0.68de	7.4 \pm 0.48a-d	4.8 \pm 1.25bc
Copper sulfate	9.3 \pm 0.21a	8.1 \pm 0.43ab	8.3 \pm 0.65a	5.7 \pm 0.80abc	6.7 \pm 0.6bcd	4.2 \pm 0.93bc
Butanone	8.9 \pm 0.41a	7.8 \pm 0.47ab	8.7 \pm 0.56a	6.6 \pm 0.93ab	8.6 \pm 0.58ab	9.2 \pm 0.25a
Pot. bicarbonate	9.7 \pm 0.15a	8.8 \pm 0.39a	9.2 \pm 0.33a	4.4 \pm 0.64bcd	5.2 \pm 0.55d	7.5 \pm 0.91ab
Azoxystrobin	8.9 \pm 0.41a	8.4 \pm 0.3ab	9.4 \pm 0.5a	4.1 \pm 0.67bcd	8.0 \pm 0.47ab	8.8 \pm 0.49a

Rosemary Oil	9.0 ± 0.3a	7.7 ± 0.56ab	8.4 ± 0.52a	0.0 ± 0e	0.1 ± 0.1e	3.4 ± 0.69c
df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99
<i>f</i>	1.14	3.7	0.69	17.44	46.29	11.8
P value	0.3480	.00006	0.7172	< 0.0001	< 0.0001	< 0.0001
24 h						
Control	8.8 ± 0.42ab	6.7 ± 0.52b	8.1 ± 0.66a	7.3 ± 0.56a	9.0 ± 0.39a	8.8 ± 0.59a
Sulfur	7.8 ± 0.53 ab	8.5 ± 0.34ab	7.8 ± 0.53a	3.9 ± 1.24b	3.3 ± 0.62c	3.4 ± 0.96bcd
Piperalin	8.8 ± 0.33ab	8.4 ± 0.37ab	8.5 ± 0.52a	0.0 ± 0c	0.0 ± 0d	0.4 ± 0.22d
Pyraclostrobin	8.5 ± 0.37ab	9.1 ± 0.28a	8.8 ± 0.44a	0.5 ± 0.17c	1.3 ± 0.5d	4.2 ± 0.98bc
Fosetyl-aluminum	8.8 ± 0.33ab	9.1 ± 0.28a	8.6 ± 0.45a	0.4 ± 0.22c	0.3 ± 0.16d	2.2 ± 0.69cd
Copper sulfate	8.8 ± 0.36ab	7.9 ± 0.43ab	7.4 ± 0.78a	4.1 ± 1.14b	6.4 ± 0.62b	1.8 ± 0.51cd
Butanone	8.8 ± 0.42ab	7.4 ± 0.56ab	7.9 ± 0.59a	6.5 ± 0.99ab	8.4 ± 0.54a	8.5 ± 0.52a
Pot. bicarbonate	8.9 ± 0.23a	8.5 ± 0.4ab	9.0 ± 0.33a	0.0 ± 0c	0.5 ± 0.22d	4.4 ± 0.78bc
Azoxystrobin	8.3 ± 0.33ab	7.5 ± 0.45ab	8.8 ± 0.49a	0.4 ± 0.16c	0.9 ± 0.23d	5.9 ± 0.86ab
Rosemary Oil	7.3 ± 0.21b	6.7 ± 0.72b	7.2 ± 0.65a	0.0 ± 0c	0.0 ± 0d	0.8 ± 0.47d

df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99
<i>f</i>	2.27	3.74	1.29	18.55	79.09	18.19
P value	0.0255	0.0006	0.2557	< 0.0001	< 0.0001	< 0.0001
48 h						
Control	8.8 ± 0.42a	5.9 ± 0.38bc	7.0 ± 0.68a	7.3 ± 0.59a	8.2 ± 0.33a	8.6 ± 0.6a
Sulfur	6.9 ± 0.59	6.9 ± 0.5ab	6.9 ± 0.59a	3.4 ± 1.28b	1.5 ± 0.65c	1.4 ± 0.52b
Piperalin	8.0 ± 0.33a	7.5 ± 0.48ab	7.4 ± 0.58a	0.0 ± 0c	0.0 ± 0c	0.0 ± 0b
Pyraclostrobin	8.0 ± 0.49a	8.7 ± 0.3a	8.3 ± 0.47a	0.0 ± 0c	0.0 ± 0c	1.2 ± 0.77b
Fosetyl-aluminum	8.0 ± 0.37a	7.8 ± 0.55ab	7.1 ± 0.82a	0.0 ± 0c	0.1 ± 0.1c	0.4 ± 0.3b
Copper sulfate	7.8 ± 0.55a	7.3 ± 0.37ab	6.5 ± 0.81a	3.5 ± 1.27b	6.0 ± 0.71b	0.7 ± 0.26b
Butanone	7.8 ± 0.57a	6.3 ± 0.6abc	7.3 ± 0.62a	6.1 ± 1.1ab	7.6 ± 0.80ab	7.0 ± 0.92a
Pot. bicarbonate	7.5 ± 0.5a	7.6 ± 0.3ab	7.9 ± 0.41a	0.0 ± 0c	0.0 ± 0c	0.0 ± 0b
Azoxystrobin	7.1 ± 0.55ab	7.2 ± 0.53ab	8.0 ± 0.65a	0.0 ± 0c	0.1 ± 0.1c	1.0 ± 0.39b
Rosemary Oil	5.1 ± 0.38b	4.1 ± 0.99c	5.6 ± 0.88a	0.0 ± 0c	0.0 ± 0c	0.0 ± 0b
df	9, 99	9, 99	9, 99	9, 99	9, 99	9, 99

<i>f</i>	4.92	5.50	1.53	16.11	70.13	40.97
P value	< 0.0001	< 0.0001	0.1511	< 0.0001	< 0.0001	< 0.0001

Table 7. Summary of compatibility of pesticides with natural enemies following IOBC guidelines (Stark et al 2007)

*Safety to natural enemies denoted by following legends: D. isaea- #, and N. californicus- **

Leafminer Materials	Miticides	Thripicides	Whitefly chemicals	Fungicides
Harmless (< 30% mortality within 48 h)				
Novaluron #	Clofentezine #		Pyriproxyfen #	Butanone #
Petroleum Oil #	Acequinocyl #		Spiromesifen #	Fosetyl-aluminum # Azoxystrobin # Potassium bicarbonate # Pyraclostrobin # Copper Sulfate # Piperalin #
Slightly Harmful (30-79% mortality within 48 h)				
Azadirachtin #	Bifenazate # *	Flonicamid # *	Flonicamid # *	Sulfur #
Cyromazine # *	Hexythiazox # *	Cyfluthrin #	Chlorpyrifos #	Rosemary Oil #
Petroleum Oil *	Spiromesifen # *	Insecticidal Soap # *	Spirotetramat # *	Butanone *
Acetamiprid #	Milbemectin #	<i>B. bassiana</i> #	Pyridaben #	Copper Sulfate *
Novaluron *	Etoxazole # *	Acetamiprid #	Thiamethoxam *	
	Clofentezine *		Spiromesifen *	
Moderately Harmful (80-98% mortality within 48 h)				

Lambda Cyhalothrin #	Abamectin #	Abamectin #	Kinoprene #	Sulfur *
Azadirachtin *	Acequinocyl *	Fluvalinate #	Thiamethoxam #	
		Chlorfenapyr #	Imidacloprid #	
		<i>B. bassiana</i> *	Lambda Cyhalothrin #	
		Acetamiprid *	Pyriproxyfen *	
			Chlorpyrifos *	
Harmful (>99% mortality within 48 h)				
Dinotefuran # *	Spinosad # *	Spinosad # *	Kinoprene *	Fosetyl-aluminum *
Bifenthrin # *	Milbemectin *	Abamectin *	Imidacloprid *	Rosemary Oil *
Lambda Cyhalothrin *	Abamectin *	Cyfluthrin *	Pyridaben *	Azoxystrobin *
Acetamiprid *		Fluvalinate *	Lambda Cyhalothrin *	Potassium bicarbonate *
		Chlorfenapyr *		Pyraclostrobin *
				Piperalin *

Figure Captions

Fig.1. Average parasitism in 6 miticide treatments and a water control over a four week period

